Handling of Instruments

Overview

If you are new to suturing, you will need to learn to recognize each of the instruments you are going to use, understand their function and practise the basic techniques of using them.

1 Scalpel

A scalpel is a razor-edged blade on a handle. There are two types of surgical scalpel: reusable and disposable.

Reusable scalpels consist of a blade that is replaced after every use, attached to a stainless steel handle that can be sterilised and re-used multiple times. In a hospital setting, this type is more likely to be used in order to reduce waste and to allow doctors to work with a variety of blades and handle sizes.

Disposable surgical scalpels are usually single-piece with a plastic handle. This is the type provided in our Hands-on Kit for practice. Although you will use the same scalpel multiple times for practice, in a clinical setting you would dispose of the entire scalpel after a single use.

1.1 Principles

A scalpel is essential for incising the skin and for sharp dissection. Held flat, it can also be useful for carefully undermining the skin edge to relieve tension.

A razor edged blade engages over a flange on the scalpel handle.

Several sizes of scalpel handle are available and size 3 is appropriate for most purposes. Each handle can be fitted with disposable blades of different shapes.

The scalpel can be held in one of two ways:

- For making large incisions e.g. laparotomy, and subcutaneous fat dissection, hold the scalpel like a table knife, with your index finger guiding the blade. This method permits good downward pressure and is safer in terms of inadvertent injury.
- For finer control and for small and delicate incisions, e.g. excision biopsy, hold the scalpel like a pen.

You will use your non-dominant hand when incising, to steady the skin. Make sure to cut away from your own fingers or thumb, to avoid the risk of injuring yourself. Never pass a scalpel blade first, but rather handle first with the blade pointing down. The safest way is to put it in a kidney dish before passing it.

Always dispose of used blades and single-use disposable scalpels in a sharps container.

1.2 Scalpel Handles

Scalpel handles can be sterilised and re-used, whereas scalpel blades need to be replaced after each use.

The most commonly used handles are nos. 3, 4 and 7.

No. 3 is appropriate for most purposes including skin incision and cutting superficial tissues such as the subcutaneous layer. It is a flat, short handle and is used with blade nos. 10, 11 and 15.

No. 4 is a bigger version of no. 3, for use with larger blades in the number range 19 to 36.

No. 7 is a long pen-like handle, rounded at the front and flat at the back. It is used for precise cutting with blade nos. 10, 11 and 15.

1.3 Scalpel Blades

A selection of disposable sterile blades of different shapes is available. Each blade has a straight blunt edge and a razor-sharp cutting edge and point. The blade has a central hole which slides over a corresponding tongue on the scalpel handle.

The most useful general-purpose blade is the no. 15. It is used for short and precise incisions in a variety of surgical procedures. The blade has a small, curved cutting edge with a flat back. Use it with handle no. 3 or 7.

The no. 11 blade is used for precision cutting and sharp, stab incisions. The blade is elongated and triangular with a strong pointed tip, flat cutting edge parallel to the handle, and a flat back. It is used with handle nos. 3 or 7.

The no. 10 blade is used for small incisions in skin and muscle and is often used in more specialised surgeries. The blade has a curved cutting edge with a flat back. It is used with handle nos. 3 or 7.

The no. 21 blade is used for major invasive procedures. It is a larger version of the no. 10, with a curved cutting edge and a flat, unsharpened back edge. It is used with a no. 4 handle.

The no. 22 blade is used for skin incisions in both cardiac and thoracic surgery. It is a larger version of the no.10 and no. 21, with a curved cutting edge and a flat, unsharpened back edge. It is used with a no. 4 handle.

The no. 36 is a larger blade used in general surgery, but also within a laboratory setting for histology and histopathology. It is used with a no. 4 handle.

1.4 Practise mounting and removing a blade (reusable scalpel)

Use a sterilised handle and a sterile disposable blade. Open the blade by peeling apart its sterile packet, using a no-touch technique.

Beware of cutting yourself when fitting the blade to the handle. Hold the blade with a haemostat (artery forceps), never with your fingers.

To mount the blade, hold the blunt edge with artery forceps and slide the blade down over the scalpel handle's tongue until it snaps home.

To remove the blade, grasp the flange furthest from the point with the haemostat and gently disengage it from the scalpel handle's tongue.

Remove the blade facing down onto an instrument trolley or into a suitable container to avoid risk of injuring yourself, patient or assistant.

Dispose of the blade in a sharps container.

1.5 Things to avoid

Every healthcare setting will have a Sharps Safety Policy covering the handling of scalpels. This must be observed at all times. Never risk cutting yourself by using your fingers to mount or remove a scalpel blade. Always use artery forceps to grasp the blade.

When passing a scalpel, never pass it blade first, but handle first with the blade facing downwards. The safest way is to always put the scalpel in a kidney dish to pass it. Always replace the scalpel in the kidney dish when you have finished making your incision.

2 Suture scissors

Suture scissors are sometimes referred to as dressing scissors. They are robust instruments with straight blades.

Several types are available. For general cutting of ties and sutures, most surgeons prefer Mayo scissors which have semi-blunt tips and are therefore less likely to accidentally damage other structures.

Sharp pointed scissors should only be used for removal of very fine sutures, where the semi-blunt ends of the Mayo scissors would not be able to get under the suture.

Suture scissors are not suitable for dissecting tissues, as using them on sutures tends to dull the blades.

2.1 Principles

To cut effectively, the scissor blades combine a parallel slicing action with a shearing action. The shearing requires a subtle opposing force by thumb and ring finger.

Cut with the tips of the scissors only.

If you are operating alone, it can be helpful to swivel the scissors round into your palm when not cutting, rather than putting them down between sutures.

Whilst left-handed scissors are available to buy, they are not included in standard instrument sets, and left-handed surgeons often lack access to them while training. A pair of right-handed scissors with good riveting may cut successfully in the left hand, but as the scissors become looser you are likely to experience problems and will need to use a different technique.

This is because the natural tendency of the left hand will be to force the blades laterally apart, and they will fail to cut. Your thumb will push down the lower part of the fulcrumed blade, so lifting up the upper part.

Your fingers will lift up the lower part of the other blade and therefore push down the upper part.

Furthermore, the cutting edge of the scissors will be behind the top blade, and you will not be able to see the cutting edge well enough to cut with accuracy.

By inverting your hand and holding the scissors differently as shown here, the scissor blades will now appose and cut successfully.

2.2 Practise right hand hold and control

Hold the scissors with your thumb in the upper finger hole and your ring finger in the lower one. Rest the scissors on your middle finger and, for better stability and control, place the index finger on the joint of the scissors.

Now try cutting. Use the tips of the scissors only.

Steady the scissors with your index finger while cutting.

Try swivelling the scissors round in your hand by releasing your thumb from the finger hole. This can be useful if you are suturing alone rather than putting them down between sutures.

Practise steadying the scissors further with your other hand. Rest the joint of the scissors on your opposite index finger for even more stability. Use the opposite index finger as a fulcrum.

2.3 Practise left hand hold and control

Invert your left hand and place the scissors in the palm. Hold one ring of the handles between your thumb and index finger. Place your middle finger in the other ring. Close the scissors by squeezing the index and middle fingers together. Cut with your hand in this inverted position.

2.4 Things to avoid

Scissors will fail to cut unless their shearing action is used. Using scissors with your non-dominant

hand reverses the direction of the normal shearing force. Unless you are aware of this and consciously correct it, the scissors will fail to cut precisely.

If you allow the scissor tips to protrude beyond the suture, you risk inadvertently cutting other structures. Sharp pointed scissors are only necessary for removal of very fine skin sutures. For cutting all other types of suture, Mayo scissors with semi-blunt tips are a safer option and will minimise the risk of accidentally cutting other structures.

3 Dissecting forceps

Dissecting forceps are used for manipulating tissues and needles. Many different sizes and designs are available, but all function similarly.

There are two essential types: non-toothed and toothed.

For most purposes other than holding skin edges, non-toothed forceps are preferable as they are less traumatic.

3.1 Principles

Dissecting forceps are like tweezers, with two springy metal legs joined at one end. Their free tips must meet accurately.

Dissecting forceps are usually held like a pen, in the non-dominant hand.

They are used to grasp tissue with delicacy and precision, and to manipulate tissues for the instrument in the dominant hand to dissect, cut or suture.

Toothed forceps require less pressure to adequately grip tough tissues such as skin, but the teeth may cause trauma to delicate tissue.

In general non-toothed forceps should be used whenever possible. The exceptions are when handling skin and bone.

3.2 Common types of dissecting forceps

Adson plain (non-toothed) dissecting forceps

- Fine dissectors
- For grasping delicate tissues to dissect out nerves and vessels

McIndoes forceps

- fine, non-toothed dissectors
- essentially similar to Adson non-toothed forceps, but slightly longer and considered easier to hold by many surgeons

Adson toothed dissecting forceps

- fine dissectors with teeth, for gripping tougher tissues
- for grasping fascia, subcutaneous fat and tendons
- inappropriate for use on delicate tissue

Gillies forceps

- fine, toothed dissectors for general use on tougher skin
- essentially similar to Adsons toothed forceps, but are slightly longer and considered easier to hold by many surgeons
- They are inappropriate for use on delicate tissue.

DeBakey forceps

- Atraumatic forceps widely used in general abdominal and vascular surgery
- Longitudinal serrations maintain a good grip, with less tissue damage
- Range of lengths and widths available
- Suitable for handling bowel, blood vessels, bile ducts etc.

3.3 Practise holding

Hold the dissecting forceps like a pen, in other words between your thumb and fingers, with the middle finger playing a pivotal role. Your hand should be relaxed and in the midway position between full pronation and full supination.

3.4 Things to avoid

Make sure you hold the forceps correctly. Holding them as shown here forces the hand into full pronation and causes strain.

Beware of causing tissue damage. Be as gentle as possible. Grasp the wound just deep to the edge, not actually on it. For most purposes other than holding skin edges, non-toothed forceps are preferable as they are less traumatic.

4 Needle holder

A needle holder has short powerful jaws and is ideal for gripping a needle securely while inserting sutures. Criss-cross lines cut into the jaws provide a firm grip on a curved needle.

4.1 Principles

The short powerful jaws and long handles provide a powerful squeezing force.

The surface of each jaw has criss-cross lines cut into it to improve the grip on a curved needle. The jaws' tips should be of tungsten carbide. This material is hard wearing and gives a good grip for

needle and suture material.

Needle holders have a ratchet on the handles, usually with three notches. This allows you to position the needle precisely in the jaws and lock the handles closed. The ratchet's teeth will tighten automatically as the handles are squeezed together. To release the ratchet, the handles must be squeezed and then moved slightly apart.

Most ratchets are designed for right-handed surgeons. Releasing a right-handed ratchet with the left hand requires practice.

Needle holders come in a variety of sizes and types, and the length and gauge of the needle holder must be appropriate for the depth needed for suture placement and the size of the needle. The most common are those in the size range 12.7cm to 14cm, such as Mayo-Hegar and Kilner.

Other types include Castroviejo needle holders which are commonly used in vascular, ophthalmic, and delicate cosmetic surgery. They come in both locking and non-locking varieties, depending on surgeon preference, and are used for very fine sutures in the 4-0 and smaller range.

4.2 Practise handling

The conventional hold is the same as for scissors. Place your ring finger and thumb in the holes. Use your index finger to steady the instrument so that you can position the jaws precisely.

An alternative grip is to hold the needle holder in your palm. Loosely grip the lower handle with your fingers and rest your thumb on the top handle. You can still use your index finger to control the jaws. Close the jaws using your thumb along the shaft of the instrument, and open by pressing the handle with the base of the thumb.

Once mastered, this grip can improve the efficiency and rhythm of your suturing. It removes the need for constantly taking your fingers in and out of the holes between bites in order to reposition the needle.

4.3 Practise positioning the needle

The central section of a curved needle is flattened. Grasp the needle on this flat section, about two thirds of the way from the point, with the tip of the needle holder's jaws. If the needle is too near the hinge, the jaws will get in the way.

Angle the needle slightly forward in the instrument's jaws. This conforms to the natural direction of your hand when inserting a suture and is more comfortable.

Squeeze the handles together to engage the ratchet and lock the needle in position. To release, squeeze the handles again and then separate fractionally.

4.4 Things to avoid

Avoid using your index finger and thumb in the needle-holder's handles as this causes loss of control.

Keeping your finger and thumb in the handle holes while suturing restricts the mobility of your hand and arm. Use the palm grip for greater efficiency.

Holding the needle too near its tip prevents you from taking a satisfactory bite because the needle holder's jaws will get in the way.

Holding it too near the swaged end may cause the needle to buckle or snap.

When suturing, do not catch the emerging needle by the point with your needle holder. This will damage the needle.

Needle holders and artery forceps look superficially similar, but it is vital that you don't confuse them. The handles or jaws of either may be curved or straight, but the crucial difference lies in the structure of the jaws.

A needle holder has short powerful jaws which should never be used to grasp tissue. The crushing action of the jaws will cause serious damage.

The artery forceps' jaws are long in relation to the handles and have parallel grooves cut in their surface. This allows them to grasp tissue without damaging it.

5 Artery forceps

Artery forceps (also called a haemostat) are designed to grasp tissue and vessels delicately and precisely.

Various sizes are available. The smallest are known as mosquito forceps and are typically used on fine, delicate vessels. Roberts forceps are longer, heavier duty forceps and are typically used on large vascular pedicles.

Artery forceps are also suitable for mounting and removing a scalpel blade.

5.1 Principles

Artery forceps allow small blood vessels and other tissue to be grasped precisely and without unnecessary damage.

The long, grooved jaws make it possible to grasp tissue delicately without extensive crushing. The grooves in each jaw coincide to form a series of circular channels when the instrument is closed. Artery forceps have a ratchet on the handles, usually with three notches. This allows you to position the artery forceps and lock the handles closed. The ratchet's teeth will tighten automatically as the

handles are squeezed together. To release the ratchet, the handles must be squeezed and then moved slightly apart.

Artery forceps and needle-holders look superficially similar. They are in fact quite different. The crucial difference lies in the structure of the jaws. Those of artery forceps are long compared to those of the needle holder and the surface of each jaw has parallel grooves cut into it. The curved jaws of artery forceps allow a blood vessel to be caught and a ligature tied around it.

Artery forceps are completely unsuitable for holding a needle, as this will align itself with the instrument's grooves and swivel round. By contrast, the needleholder's jaws have criss-cross lines cut into them to improve the grip on a curved needle.

5.2 Practise right hand hold and control

Place your ring finger and thumb in the artery forceps' finger holes.

Use your index finger to steady the instrument where the blades join, so that you can position the jaws precisely.

Close the handles to engage the ratchet, taking care not to overtighten them. To release, first squeeze the handles to disengage the ratchet, then separate the handles fractionally while opening them.

Most ratchets are designed for right-handed surgeons. Releasing a right-handed ratchet with the left hand requires a conscious effort and a different technique.

5.3 Practise left hand hold and control

Opening and closing the ratchet when holding artery forceps in your left hand requires a different technique. Hold one ring of the handles between your thumb and index finger and rest your middle and ring finger against the other ring. Then apply pressure from the middle and ring finger against the thumb and index finger to open the artery forceps in a controlled way. Try and avoid a jerky opening movement which could result in damage to any tissue or vessel that you are holding.

5.4 Things to avoid

Avoid confusing artery forceps and needle holders which look superficially similar. Their jaws are in fact quite different.

Artery forceps have long, jaws with parallel grooves. Needle holders have short jaws with criss-crossed lines cut into them.

If you mistakenly use artery forceps as a needle holder for suturing, the needle will align itself along one of those channels between the jaws. It will then swivel round, making it impossible to put in the suture with precision.

Do not use your index finger and thumb in the artery forceps' handles as this will cause loss of control. Use your ring finger and thumb.

If using artery forceps as an assistant in a procedure, you should not release the artery forceps until instructed to do so by the surgeon. Be aware of inadvertent release.