

### Introduction to Using a Scalpel

Scalpels are an important tool for performing surgical approaches and tissue dissections. However, if used incorrectly, scalpels pose a danger to both the patient and the surgical team. It is very important to learn how to handle a scalpel correctly, whether using it, handing it to someone, or changing the blade. In this module we will discuss how to safely arm, disarm, and pass a scalpel, as well as how to grip a scalpel and the methods of cutting with a scalpel blade. We will also examine the types of scalpel blades and handles that are commonly used in veterinary practice and their surgical applications.

### Anatomy of a Scalpel Blade

#### Edge

The edge of the scalpel blade is the sharp cutting surface. Scalpel blades are available in a variety of different styles. The main differences relate to the overall size of the blade or the shape of the cutting edge.

#### Spine

The spine of the scalpel blade is the unsharpened, rigid edge. Scalpel blades are generally made of hardened and tempered steel, stainless steel, or high carbon steel.

#### Slot

The most common type of scalpel blade used in surgery is the non-attached, replaceable blade. This type of blade has a key-like slot at the angled base that securely locks the scalpel blade to the scalpel handle. The scalpel handle is "armed" or "disarmed" by sliding the end of the handle in or out of the slot.

### Types of Scalpel Blades

Scalpel blades come in a variety of sizes, commonly referred to by the blade number. Blades also vary by length and shape of the cutting edge, with each blade suited to

different purposes. In this topic, we will explore several types of surgical blades commonly used in veterinary surgery. Learn more about each blade below.

The No.10 blade, with its large, curved cutting edge, is one of the more traditional blade shapes used in veterinary surgery. It is generally used for making large incisions in the skin and subcutaneous tissue, as well as cutting other soft tissues.

The No.11 blade is an elongated, triangular blade sharpened along the hypotenuse edge. It has a strong, pointed tip, making it ideal for stab incisions and precise, short cuts in shallow, recessed areas. It is used in various procedures, such as the creation of incisions for chest tubes and drains, opening major blood vessels for catheter insertion (cut-downs), removing the mop ends of torn cruciate ligaments, and for meniscectomy.

The No.12 blade is a small, pointed, crescent-shaped blade sharpened along the inside edge of the curve. It is sometimes utilized as a suture cutter. Occasionally the No.12 blade is used for cat declaws and disarticulating small joints, such as those between the metacarpals, metatarsals, and phalanges during digit amputation.

The No.15 blade has a small, curved cutting edge. It is one of the most popular blades in small-animal surgery because its shape is ideal for making short and precise incisions. It is utilized in a variety of surgical procedures, including the excision of small skin lesions, organ biopsy, and fine neurological applications.

The No.22 blade is a larger version of the No.10 blade with a curved cutting edge and a flat, unsharpened back edge. It is often used for creating large incisions through thick skin, and for soft tissue dissection in large-animal surgery.

## **Anatomy of a Scalpel Handle**

### **Handle**

The handle of the scalpel blade is the part of the instrument that is gripped by the surgeon. The handles are made such that both right- and left-handed individuals can use the same handle safely and effectively.

### **Blade lock**

The blade lock is the longitudinal groove on the end of the scalpel handle. The blade lock engages with the slot on the blade, locking the blade onto the handle. The angled base of the blade and the blade lock are not necessarily interchangeable. When arming a scalpel, make certain that you select the correct number blade to fit the scalpel handle.

## **Types of Scalpel Handles**

Scalpel handles come in a variety of lengths, and should be chosen to suit their intended use. In this topic, we will explore the two types of scalpel handles commonly used in veterinary surgery. Click on the scalpel handles shown here to learn more about each one.

The standard scalpel handle used in veterinary surgery is the #3 size. The #3 features a short handle that is useful for making skin incisions and for cutting superficial tissues, such as the subcutaneous layer.

The #3L has a longer handle than the #3, making it suitable for incising in deep, remote areas such as the thoracic cavity.

## **Arming a Scalpel**

Arming and disarming scalpels, sometimes called “loading” and “unloading,” are challenging techniques to master. They require the coordinated use of a needle holder. In order to avoid potentially serious injury, it is important to learn how to perform these techniques safely before attempting them.

The first rule when arming a scalpel, is NEVER try to arm the scalpel with your fingers! The spine of the blade has a small surface area, and there is very little room to securely grasp the blade with your fingers without coming

dangerously close to the touching the sharp blade.

To arm a scalpel blade properly, begin by having a non-sterile assistant peel back the package to expose the base of the blade for you. It is important that the assistant avoids touching any portion of the sterile blade.

Once the base of the blade is exposed, have the assistant orient the angled base toward you and the sharp edge of the blade away from you. Then grasp the blade in the jaws of the needle holder at a 45–90 degree angle. Being careful not to touch any part of the package’s surface, slide the blade out of the package.

Make certain that the needle holder is gripping the spine of the blade just above the blade slot. If necessary, reposition the blade in the jaws of the needle holder. However, be certain that you do NOT grip the sharpened scalpel edge with the jaws of the needle holder at any point during this procedure; this is unsafe and will dull the cutting edge.

An alternative method for opening scalpel blades is to have a non-sterile assistant open the package and drop the blade onto the surface of the sterile instrument tray. However, this method is not preferred because the blade can easily become lost in a busy surgical field or bounce off the field altogether. On occasion, the blade might even pierce through the surgical drapes, resulting in a breach of sterile technique. If the drop method is used, it is important for either the surgeon or the assistant surgeon to pause and observe where the blade falls. The surgeon should then grasp the blade with the needle holders. If necessary, fingers can be used to help adjust the blade to a 45-90 degree angle relative to the axis of the needle holder, as previously described.

Once the spine of the blade is secured properly in the needle holder, align the slot in the angled base of the blade over the blade lock on the scalpel handle. Carefully slide the blade down the track until the slot in the blade snaps into place on the blade lock.

While loading the scalpel, if the blade lodges on the blade lock, carefully pull it off with the needle holder. Then reinsert the blade, making sure it slides smoothly within the track of the blade lock. The scalpel is now armed and ready for use.

## Disarming a Scalpel

Just as in arming a scalpel, it is very important to learn how to disarm a scalpel correctly in order to avoid potentially serious injury. In this topic, we will demonstrate each step of the disarming technique.

Using your non-dominant hand, grasp the surgical scalpel in the center of the handle. Position the blade lock facing upward. With the angled base of the blade facing your hand, orient the cutting edge of the blade away from yourself and others.

Use the tips of the needle holder to grip the slanted edge of the blade base. Make certain that you have a firm grasp on the blade base so that the needle holder does not slip off.

Carefully lift the blade from the slanted end of the blade lock until the key-like blade slot separates from the handle lock. You might hear a click, and the blade will loosen on the scalpel handle. Push the blade away from yourself and toward the tip of the scalpel handle. If the blade lodges as you try to remove it, you might need to twist or wiggle the blade slightly as you slide it off.

Dispose of the used blade properly by placing it in a specified “sharps” container, being careful not to touch any non-sterile surfaces during blade disposal.

## Handing Off Scalpels

An important part of scalpel safety is learning the proper technique for safely handing off scalpels to other members of the surgical team. Keep in mind that safe handling of scalpels not only reduces sharps-related injuries, but also minimizes potential exposure to zoonotic pathogens.

To hand off an armed scalpel, begin by grasping the surgical scalpel in the center of the handle

with your dominant hand. Orient the blade facing away from your palm and away from the person to whom you want to hand the scalpel.

Firmly place the scalpel handle in the outstretched hand of the person receiving the scalpel, but do not immediately withdraw your hand. Once he or she has a firm grasp of the handle, slowly remove your hand.

A common mistake when handing off scalpels is for the person receiving the scalpel to pull it away too soon. To avoid injury, the person receiving the scalpel should grasp it and then wait until the other person’s hand is completely withdrawn before he or she pulls the scalpel away.

## Scalpel Grips

This topic will focus on the various methods for holding the scalpel. The scalpel can be held in three ways: the pencil grip, the fingertip grip, and the palmed grip. Although each grip can be used to incise tissue, each has its advantages and limitations. Learn more about scalpel grips below.

### PENCIL GRIP

In the pencil grip, the scalpel is grasped close to the blade between the tips of the thumb and index finger, with the remaining handle resting on the web of the thumb, much like grasping a pencil. In this grip, the motion comes predominately from the thumb and index finger, allowing for precise cutting of tissue. To increase the accuracy of the fine cutting, you can also steady your hand by resting it on the patient as you cut. The pencil grip can also be “backhanded” by reversing the direction of the blade without changing the upper arm position.

### Advantages

Grasping the scalpel handle like a pencil allows short, fine movements, using the muscles of the hand, with less contribution from muscles of the forearm. The pencil grip is therefore most useful for making small, precise incisions.

### Limitations

In the pencil grip, the blade edge is held at a 30–

to 40-degree angle to the tissue. In comparison to the other scalpel grips, this greater angle diminishes the cutting edge contact, limiting both depth and direction control. Thus, the pencil grip is not ideal for creating long, straight skin incisions.

### **FINGERTIP GRIP**

In the fingertip grip, the scalpel is held between the thumb and middle finger, while the index finger is placed on the spine of the scalpel blade to apply downward pressure, much like grasping a butter knife. This grip is used primarily for making long skin incisions, using arm motion, rather than using the finger motion associated with the pencil grip.

#### *Advantages*

The chief advantages of the fingertip grip are that it provides good depth and direction control. Because this grip maximizes the length of blade that comes into contact with the tissue, any changes in blade pressure are distributed over a greater length. This delivers less pressure to each increment of tissue and allows for greater security of depth control. Additionally, the greater the length of tissue in contact with the scalpel, the more the walls of the incision resist minute or sudden changes in direction, allowing for smoother, straighter incisions. The combined advantages of both depth and direction control make the fingertip grip well suited to creating long incisions.

#### *Limitations*

The fingertip grip does not allow for precise blade cuts, so it is not used when delicate, precise scalpel cuts are required, such as in ophthalmic and vascular procedures.

### **PALM GRIP**

In the palm grip, the fingers are wrapped around the scalpel handle and the thumb anchors the handle. Force is applied to the handle with forearm pressure and the wrist is held straight.

#### *Advantages*

The palm grip is the strongest, most secure way to grasp the scalpel handle, but it is RARELY indicated for most veterinary surgery

applications. Its main surgical use is when great pressure is needed to cut through very dense tissue. The most common use for the palm grip is to cut open cadavers during a necropsy examination.

#### *Limitations*

In the palm grip, the grasp is held well away from the cutting blade edge and forearm pressure is used to exert force, resulting in little control over blade pressure. This lack of pressure control means that the palm grip should NOT be used for surgeries that require accuracy and control!

### **Incision Methods**

Now that you have some knowledge about the types of scalpel grips used in surgery, we will focus on the different methods of cutting with a scalpel. For most surgical applications, the scalpel blade is used for press cutting and slide cutting, and more rarely for scrape cutting. Learn more about the three incision methods below.

#### **PRESS CUTTING**

To incise tissue with a press cut, begin by grasping the scalpel in a pencil grip. With the blade positioned over the tissue, slowly increase downward pressure on the blade tip. When the bursting strength threshold of the tissue is exceeded, the blade will suddenly “pop” through the targeted tissue. In press cutting, the direction of the pressure exerted by the surgeon is the same as the direction of the blade motion as it cuts through the tissue. A stab incision is a classic example of a press cut.

#### *Advantages and Applications*

With press cutting, the wound is well controlled in both length and direction, as the length of the wound is exactly the width of the scalpel blade and the direction is in line with the plane of the blade. Press cutting is useful for making stab incisions in hollow structures. Once the wall is penetrated, the hollow space below the blade provides space for the blade to decelerate and stop without damaging deeper structures. The press cut is often used in veterinary surgery to

drain abscesses and to open the bladder, stomach, and intestines.

### *Limitations*

The usefulness of press cutting in surgery is limited by the all-or-none quality of tissue depth penetration. It is important to realize that depth control is not precise with press cutting; the pressure needed to overcome starting friction is greater than the pressure needed to continue the path of the scalpel once the tissue begins to part. Additionally, the outer layer of tissue generally has greater bursting threshold than deeper layers, which further accentuates this depth control problem. To mitigate this problem, position the sharp edge facing your palm, and use your index finger as a “bumper” to expose only a limited amount of the blade tip. Then rest your knife hand against the patient during the stab incision to limit the depth of the blade plunge.

### **SLIDE CUTTING**

To perform a slide cut, the scalpel is generally grasped in the fingertip grip. The cut is made by sliding the blade on its cutting edge, while exerting a sub-bursting pressure on the tissue. In the slide cut, the cutting motion is at a right angle to the direction of the scalpel pressure. The depth of the incision is determined by the amount of pressure exerted, the length of blade distributing that pressure, and the resistance to cutting of the tissue being incised. Light pressure, combined with an increased blade surface-area-to-skin ratio, results in a more superficial cut.

### *Advantages and Applications*

In slide cutting, depth control is precise since the bursting pressure is never exceeded. The slide cut is the most applicable cut for most veterinary scalpel applications. In particular, it is well suited to skin incisions because it allows accurate depth control and precise direction and length control.

### *Limitations*

The main limitation of the slide cut is that it does not allow for short, deep incisions in tissue.

### **SCRAPE CUTTING**

To perform a scrape cut, the scalpel can be grasped in either a pencil or fingertip grip. When scraping delicate tissue, such as an anal-sac wall, the pencil grip is generally preferred. The cutting motion in the scrape cut involves exerting sub-bursting pressure while moving the scalpel perpendicular to the edge of the blade and the direction of the pressure. Scrape cutting is exactly the same motion used when shaving hair with a razor blade.

### *Advantages and Applications*

Scrape cutting is a precise way to separate layers of tissues without cutting the deeper layers beneath the blade, known as “button-holing.” Button-holing can easily occur with push cutting, and sometimes with slide cutting. Scrape cutting is used for developing pouches for devices and the separation of fascial planes in reconstructive surgery: for example, when separating tissue from fascia during mastectomy. Scrape cutting is also used when separating muscle attachments to the anal sac without rupturing the deeper, thin sac wall during anal sacculotomy in dogs, cats, and ferrets. The scraping motion also provides some security from perforation of surfaces when releasing adhesions (lysing), and in “scarifying” the serosal surfaces of viscera for purposefully creating an adhesion, as in colopexies for recurrent rectal prolapse.

### *Limitations*

Scrape cutting is not an efficient method for incising tissue. This cutting technique is also more traumatic to tissues than sharp dissection with a slide cut.

### **How to Incise Skin**

A good-quality skin incision requires careful planning and a skilled execution. During the cutting motion, the surgeon must control the direction, length, and depth of the incision. Obtaining the desired outcome requires an understanding of all the components involved in making an incision, as well as practice putting all of these elements together. In this topic,

we will examine the seven elements required to make a proper skin incision.

Before beginning any incision, carefully plan your surgical approach. With the patient in a neutral position and the skin undistorted, establish the starting and stopping landmarks of your incision. Surgeons often plan their incision using visible landmarks, such as the umbilicus, or palpable bony structures like the greater tubercle or xiphoid cartilage. Keep in mind that skin is pliable and might be inadvertently shifted out of neutral position, especially in loose skinned animals. As you advance your blade along your incision, be careful not to distort the skin, as this can lead to accidental incisions over vital structures or difficulty reaching or identifying a muscle or fascial plane for deeper dissection. When planning a complex approach, such as a curvilinear incision, a sterile marking pen is often helpful. Marking the proposed incision for a complex approach, like the craniolateral approach to the hip, helps to prevent skin distortion and abrupt angles.

To make a skin incision, begin by grasping the scalpel blade in the fingertip grip. Using the slide-cut technique, incise the skin full thickness in one smooth stroke. Often the novice surgeon errs towards a “stop and go” approach, resulting in short, choppy incisions that do not penetrate full-thickness skin. The problem with this technique is that the surgeon must then try to retrace the first incision accurately, or the second incision will isolate and devitalize an island of skin. Devitalized islands should be avoided as they lead to wound complications after closure.

To avoid such problems, strive to complete the entire incision in one smooth stroke, before the blade is ever pulled from the skin incision. Only on rare occasions do you need to stop the skin incision before completion, as when a large subdermal vessel is traversed and is found to bleed excessively.

Redundant skin that bunches up in the path of the blade results in a jagged incision. To

prevent bunching and to control the direction of the scalpel, use your non-dominant hand to pull the skin away from the direction of the blade, while using your thumb and index finger to place tension perpendicular to the blade. If tension is not maintained during an incision, redundant skin will “catch” on the blade, and this might cause the blade to skip, resulting in a serrated incision.

When making long incisions, the assisting hand might need to advance 3–4 times to maintain the appropriate skin tension. However, be careful not to advance the assisting hand past the leading edge of the blade. When pausing the incision to advance the assisting hand, do not remove the blade from the tissue. Removing and reinserting the blade makes it difficult to stay on the same track, resulting in “jogs” in the incision.

In most cases, the surgeon should be the only person touching and stretching the skin during skin incising. If an assistant is used to place tension on one side of the incision and the surgeon on the other, neither person has any idea how much tension is being exerted by the other. If one side is under more tension, the skin incision will be created as a bow toward the side under less tension.

Ideally, skin should be incised full-thickness into the hypodermis throughout the incision with the first pass of the blade. Surgeons use the distance of skin separation during slide cutting to assess and control the depth of their incisions. During the slide cut, watch as the edges of the skin begin to part. Blade pressure should be increased until the skin edges part about 1.5–2 cm. This ideal pressure is then maintained throughout the length of the incision. Keep in mind that in a thin-skinned greyhound, little pressure will be needed to create a 1.5 cm wide, full-thickness skin incision. However, when incising thicker skin, like the neck of a bulldog, significantly more pressure will be required.

A common error made by novice surgeons is to exert insufficient pressure, resulting in partial skin penetration. If the skin is only partially cut

during the incision, a V-shaped groove will appear and the skin edges will not separate. This “V” often fills with blood, making it difficult to observe the apex of the “V.” The second stroke of the scalpel, required to complete the skin transection, will then miss the apex of the “V,” creating a jagged tissue cut. To avoid this mistake, always monitor the edges of the skin incision to ensure that the optimal amount of pressure is being applied to the scalpel.

Ideally, you should cut the skin just beyond the hypodermis, but not into the deeper subcutaneous tissue where larger blood vessels can be damaged. If the skin incision is created this way, larger subcutaneous vessels can be identified and ligated (tied-off with suture), or sealed with electrocoagulation, before they are incised. This ensures a cleaner, dryer incision field, facilitating the identification of deeper tissue layers for a more accurate dissection.

One of the keys to creating a good incision is to watch where the blade has been, rather than focusing solely on where the blade is going. Although this may initially seem counter-intuitive, whether you are making a straight or a curved incision, pay attention to the segment that has already been cut. Following this principle allows you to monitor the separation of the skin edges so that you can assess and adjust the amount of pressure needed to create an incision at the proper depth. Watching where the scalpel has been, while remaining cognizant of where it is going, also helps you keep your incision on the desired path.

When making a skin incision, always make the cut perpendicular to the surface of the skin. Novice surgeons have a tendency to keep the blade perpendicular to the floor instead of

perpendicular to the surface of the skin, resulting in an angled incision. When the skin is cut on an angle, the slanted cut surfaces tend to override one another during skin closure. This overridden edge is unsightly and might increase scar formation. It can also be a source of irritation to the patient, leading to self-excoriation.

Once the skin incision has been completed, bleeding from transected vessels should be controlled. Controlling the bleeding allows for better visualization of the underlying subcutaneous fat. If possible, the next incision through the fat should be made directly in line with the skin incision. The alignment of tissue layers relieves tension on the sutures, promoting accurate wound closure and viable skin edges.

Now that we examined each of the elements of an ideal incision in isolation, let's put all the steps together into one demonstration.

With the skin in a neutral position, plan your skin-incision dimensions. Hold the scalpel with the fingertip grip and stabilize the skin with the assisting hand. As the skin is incised, watch how far the skin separates in order to gauge the appropriate pressure needed to incise through the skin into the hypodermis. Continue the skin incision throughout the entire planned wound length, without lifting the scalpel off the skin, and advance the assisting hand as necessary to keep the skin from catching. Maintain the blade angle perpendicular to the skin surface, not the surgery table. Control bleeding from any transected vessels to visualize the deeper tissue layers. Finally, extend the incision through the subcutaneous fat, making certain that all tissue layers are properly aligned.

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