

Turner and McIlwraith's Techniques in Large Animal Surgery

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Chapter 1

PRESURGICAL CONSIDERATIONS

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Objectives

1. Discuss some of the presurgical considerations that can affect the success of a procedure, including the physiological state and condition of the patient; the predisposing factors for infection; and the limitations of the surgeon, facilities, and equipment.
2. Describe the methods of asepsis and antisepsis.
3. Describe the classification of different procedures with regard to risk of infection and degree of contamination.
4. Discuss the judicious use of antibiotics and their applications prophylaxis and postoperative infection.
5. Describe proper techniques for surgical site preparation.

Preoperative Evaluation of the Patient

Before a surgical procedure, a physical examination is generally indicated. This applies to both emergency and elective surgery. The following are laboratory tests that are generally indicated for horses based upon animal age and systemic status at our clinic:

- For horses younger than 4 years old and healthy:
 - Packed cell volume (PCV)
 - Total protein
- Appropriate for horses greater than 4 years old or those that are systemically ill:
 - Complete blood count (CBC)
 - Chemistry

Exactly where to draw the line on laboratory tests is largely a matter of judgment on the part of the surgeon. Obviously, if the surgery consists of castration of several litters of piglets, then for purely economic reasons laboratory tests prior to surgery may not be performed. In many cases, however, additional tests will be necessary. The following are examples of other optional tests and their indications:

- Electrolyte measurement for right-sided abomasal diseases of the dairy cow
- Urinalysis in the dairy cow to evaluate the presence of ketosis
- Measurement of blood urea nitrogen (BUN) and creatinine if urinary problems are suspected
- Analysis of peritoneal fluid prior to laparotomy for horses with colic
- Full chemistry panels when there are age or systemic considerations

If any laboratory parameters are abnormal, the underlying causes should be investigated and efforts made to correct them. In “elective” surgery this is possible, but it may not be possible in an emergency. The owner should be made aware of any problems prior to subjecting the animal to surgery. Risks are always present in normal elective surgery, and these should be explained to the owner. It is always better to have an early, frank discussion with the owner about the possible risks associated with the surgery than to have the discussion after the risk has been realized.

Fluid replacement should be performed if necessary. In the elective case, the surgical procedure should be postponed if the animal’s physical condition or laboratory parameters are abnormal. In some animals, internal and external parasitism may have to be rectified to achieve this goal.

Medical records should be kept at all times. Obviously this can be difficult in such cases as castration of several litters of piglets. However, record keeping should become

an essential part of the procedure for horses and cattle in a hospital, and herd records should be kept in all other situations. Finally, if the animal is insured, the insurance company must be notified of any surgical procedure; otherwise, the policy may be void.

Surgical Judgment

Surgical judgment cannot be learned overnight by reading a surgery textbook, nor is it necessarily attained by years of experience. The surgeon who continually makes the same mistake will probably never possess good surgical judgment. Not only should the surgeon learn from his own mistakes; he also should learn from the mistakes of others, including those documented in the surgical literature. As part of surgical judgment, the surgeon must ask the following questions:

- Is the surgery necessary?
- What would happen if the surgery were not performed?
- Is the procedure within the capabilities of the surgeon, the facilities, and the technical help?

If the surgeon finds that the procedure is too advanced for his or her capabilities and/or facilities, the surgery should be referred. Some veterinarians have a fear that this will mean loss of the client's business in the future, but this is rarely the case. If the surgeon explains why the case should be referred elsewhere, most clients will be grateful for such frankness and honesty. It is inexcusable to operate on a patient and then have complications arise due to inadequate training and facilities, when the surgery could easily have been referred to a well-equipped, well-staffed hospital with specially qualified personnel. Clearly, this rule has exceptions—mainly the emergency patient, which may fare better by undergoing immediate surgery than being subjected to a long trailer ride to another facility.

Many of the procedures described in this book can be done “on the farm.” Some, such as arthrotomy for removal of chip fractures of the carpal and sesamoid bones in horses, should be done in a dust-free operating theater. If clients want these latter procedures to be done “in the field,” they should understand the disastrous consequences of postsurgical infection. The surgeon must be the final judge of whether his facilities or experience are suitable.

Principles of Asepsis and Antisepsis

There are four main determinants for a surgical site infection (SSI): host defense, physiologic derangement, bacterial contamination risk at surgery, and prolonged surgical time.¹ Other factors that impact infection of deep structures and organs include hypoalbuminemia and a prior

Table 1.1. Surgical classifications.

Classification	Description	Examples
Clean	Gastrointestinal, urinary, or respiratory tract is not entered.	Arthrotomy for removal of a chip fracture of a carpal bone of a horse
Clean-contaminated	Gastrointestinal, respiratory, or urinary tract is entered. There is no spillage of contaminated contents.	Abomasopexy for displaced abomasum in the dairy cow
Contaminated-dirty	Gross spillage of contaminated body contents or acute inflammation occurs.	Wounds Abscesses Devitalized bowel

operation.² Perioperative blood loss also contributes to SSI.³ Control methods include aseptic surgical practices as well as identification of the high-risk patient, correction of systemic imbalances prior to surgery, and the proper use of prophylactic antibiotics.

We are sometimes reminded by fellow veterinarians in the field that we must teach undergraduates how to do surgery in the real world. By this they mean that we must ignore aseptic draping and gloving and lower the standard to a “practical” level. This is fallacious in our opinion. Although we recognize that while the ideal may be unattainable in private practice, one should always strive for the highest possible standard; otherwise, the final standard of practice may be so low that the well-being of the patient is at risk, not to mention the reputation of the veterinarian as a surgeon. For this reason, we believe that it behooves us as instructors of undergraduates to teach the *best possible methods with regard to asepsis as well as technique*.

The extent to which the practice of asepsis or even antisepsis is carried out depends on the classification of the operation, as shown in Table 1.1. This classification may also help the veterinarian decide whether antibiotics are indicated or whether postoperative infection can be anticipated.

Surgical Classifications

Once the surgeon has categorized the surgical procedure, appropriate precautions to avoid postoperative infection can be determined. In all cases, however, the surgical site is prepared properly, including clipping and aseptic scrubbing.

Whatever category of surgery is performed, clean clothing should be worn. The wearing of surgical gloves is good policy even if only to protect the operator from infectious organisms that may be present at the surgical site. Surgical gowns, gloves, and caps are recommended for clean surgical procedures, although such attire has obvious practical limitations for the large animal surgeon operating in the field. The purpose of this book is to present guidelines rather than to lay down hard-and-fast rules. For example, the decision between wearing caps, gowns, and gloves and wearing just gloves can be made only by the surgeon. Good surgical judgment is required. In general, it is better to be more careful than what may appear necessary in order to be better prepared when problems arise.

Role of Antibiotics

Antibiotics should never be used to cover flaws in surgical technique. The young surgeon is often tempted, sometimes under pressure from the client, to use antibiotics prophylactically. However, the disadvantages of antimicrobial therapy often outweigh its benefits. Extended periods of antimicrobial therapy can select for resistant organisms and adversely affect the gastrointestinal tract by eliminating many of the normal enteric organisms and allowing outgrowths of pathogenic bacteria, such as *Clostridia* spp., which can result in colitis and diarrhea.⁴ When selecting an antibiotic regimen, the surgeon should consider the following aspects:

- Does the diagnosis warrant antibiotics?
- Which organisms are most likely to be involved, and what is their in-vitro antimicrobial susceptibility?
- What is the location or likely location of the infection?
- How accessible is the location of the infection to the drug?
- What possible adverse reactions and toxicities to the drug could occur?
- What dosage and duration of treatment are necessary to obtain sufficient concentrations of the drug?

Again, some judgment is required, but suffice it to say, antibiotics should never be substitutes for “surgical conscience.” *Surgical conscience* consists of the following: dissection along tissue planes, gentleness in handling tissues, adequate hemostasis, selection of the best surgical approach, correct choice of suture material (both size and type), closure of dead space, and short operating time.

If the surgeon decides that antibiotics are indicated, special attention should be given to selecting the type of antimicrobial drug, the dosage, and the duration of use. Ample scientific literature indicates that for maximum benefit, antimicrobials should be administered prophylactically prior to surgery and, at the latest, during surgery. Beyond 4 hours postsurgically, the administration of prophylactic antibiotics has little to no effect on the incidence

of postoperative infection.¹ The duration of treatment should not exceed 24 hours because most research indicates that antimicrobial use after this period of time does not confer further benefits. If longer duration of antimicrobial coverage is necessary, the full duration of the specific antimicrobial drug selected should be given. This varies depending on the drug; however, in most cases the duration is at least 3 and up to 5 days. If the surgeon is operating on a food animal, there are regulations for withdrawal times from different antimicrobial drugs prior to slaughter that must be taken into account.

If topical antibiotics are used during surgery, they should be nonirritating to the tissues; otherwise, tissue necrosis from cellular damage will outweigh any advantageous effects of the antibiotics. It is also beneficial when using topical antibiotics to use antibiotics that are not generally used systemically.

All equine surgical patients should have tetanus prophylaxis. If the immunization program is doubtful, the horse can receive 1500–3000 units of tetanus antitoxin. Horses on a permanent immunization program that have not had tetanus toxoid within the previous 6 months should receive a booster injection.

Tetanus prophylaxis is generally not provided for food animals, but an immunization program may be considered, especially if a specific predisposition is thought to exist.

Preoperative Planning

The surgeon should be thoroughly familiar with the regional anatomy. In this book we illustrate what we consider to be the important structures in each technique. If more detail is required, a suitable anatomy text should be consulted. Not only should the procedure be planned prior to the surgery, but the surgeon also should visit the dissection room and review local anatomy on cadavers prior to attempting surgery on a client's animal. We are fortunate in veterinary surgery to have greater access to cadavers than our counterparts in human surgery.

Preparation of the Surgical Site

For the large animal surgeon, preparation of the surgical site can present major problems, especially in the winter and spring when farms can be muddy. Preparation for surgery may have to begin with removal of dirt and manure. Some animals that have been recumbent in mud and filth for various reasons may have to be hosed off. Hair should then be removed, not just from the surgical site, but from an adequate area surrounding the surgical site.

The clipping should be done in a neat square or rectangular shape with straight edges. Surprisingly, this, along with the neatness of the final suture pattern in the skin,

is how the client judges the skill of the surgeon. Clipping may be done initially with a no. 10 clipper blade, and then the finer no. 40 blade may be used. The incision site can be shaved with a straight razor in horses and cattle, but debate exists regarding the benefit or problems associated with this procedure. In sheep and goats, in which the skin is supple and pliable, it is difficult to shave the edges.

Preparation of the surgical site, such as the ventral midline of a horse about to undergo an exploratory laparotomy, may have to be performed when the animal is anesthetized. If surgery is to be done with the animal standing, an initial surgical scrub, followed by the appropriate local anesthetic technique and a final scrub, is standard procedure.

For cattle or pigs, the skin of the surgical site can be prepared for surgery with the aid of a stiff brush. For horses, gauze sponges are recommended. Sheep may require defatting of the skin with alcohol prior to the actual skin scrub. The antiseptic scrub solution used is generally a matter of personal preference. Either povidone-iodine scrub (Betadine Scrub) alternated with a 70% alcohol rinse, or Chlorhexidine alternated with water, can be used. Finally, the skin can be sprayed with povidone-iodine solution (Betadine Solution) and allowed to dry.

Scrubbing of the proposed surgical site is done immediately prior to the operation. Scrubbing should commence at the proposed site of the incision and progress toward the periphery; one must be sure not to come back onto a previously scrubbed area. Some equine surgeons clip and shave the surgical site the night before the surgery, perform an aseptic preparation as previously described, and wrap the limb in a sterile bandage until the next day. A shaving nick made the day before surgery may be a pustule on the day of surgery, however, so this is generally not recommended for anything proximal to the pastern region.

When aseptic surgery is to be performed, an efficient draping system is mandatory. Generally, time taken to drape the animal properly is well spent. The draping of cattle in the standing position can be difficult, especially if the animal decides to move or becomes restless. It can be difficult to secure drapes with towel clamps in the conscious animal because only the operative site is anesthetized. However, if the surgeon applies slow pressure when closing the towel clamps, most animals will tolerate their application, even if the local site is not desensitized. If draping is not done, the surgeon must minimize contact with parts of the animal that have not been scrubbed. The tail must be tied to prevent it from flicking into the surgical field.

Several operations described in this book require the strictest of aseptic technique; sterile, antimicrobial, adhe-

sive, incise drapes are indicated. Characteristics of sterile plastic adhesive drapes include their ability to adhere, their antimicrobial activity, and their clarity when applied to the skin. Probably the most desirable feature is the one first mentioned. With excessive traction or manipulation, some brands of drapes quickly separate from the skin surfaces, and this separation instantly defeats their purpose.

Rubberized drapes are helpful when large amounts of fluids (such as peritoneal and amniotic fluid) are encountered during the procedure. Rubberized drapes are also useful to isolate the bowel or any other organ that is potentially contaminated, to prevent contamination of drapes. Newer fluid-impermeable paper drapes that are disposable make the surgeon's job even easier.

Postoperative Infection

Prevention of postoperative infection should be the goal of the surgeon, but infection may occur despite all measures taken to prevent it. If infection occurs, the surgeon must decide whether antibiotic treatment is indicated, or whether the animal is strong enough to fight it using its own defense mechanisms. Some surgical wounds require drainage at their most ventral part, whereas others require more aggressive treatment. If, in the judgment of the surgeon, the infection appears to be serious, a Gram stain, culture, and sensitivity testing of the offending microorganism(s) will be indicated. A Gram stain may give the surgeon a better idea of what type of organism is involved and may in turn narrow the selection of antibiotics. Sometimes in-vitro sensitivities have to be ignored because the antibiotic of choice would be prohibitively expensive. This is especially true for adult cattle and horses. A broad-spectrum antibiotic should be given, if possible, as soon as practical.

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