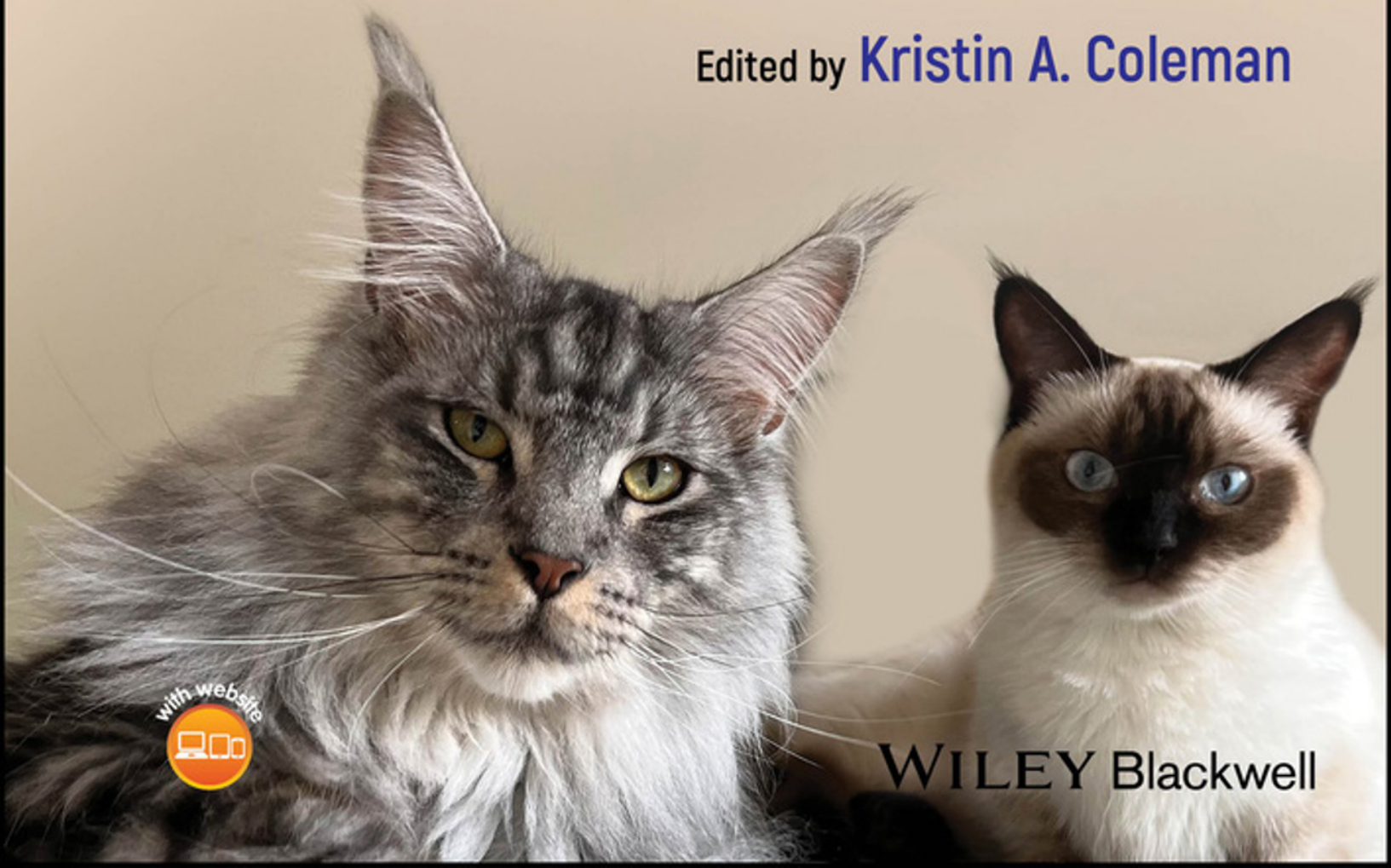
Techniques in Small Animal Soft Tissue, Orthopedic, and Ophthalmic Surgery

Edited by Kristin A. Coleman



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Edited by

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We dedicate this book to the families, friends, and animals who supported our hard work in writing these book chapters during free time from our day jobs. My own animals, Kelev (sweet tiny brown dog), Ludwig (obnoxious Maine Coon), Miel (meek ginger cat), and Lilliputian (mischievous apple-headed Siamese Munchkin), were essential to my own sanity when writing chapters for and editing this book.

I personally dedicate this book in memory of my mom, who encouraged my love for and need to care for animals from a young age, and in memory of my dad, who passed away within an hour of the phone call during which I accepted the invitation to write this textbook and who was the one always pushing me to exceed what I thought were my own limits. The dedication, determination, and long hours that went into creating and editing this manuscript were always with the memory of them in my heart and mind. This one was for you, Mama and Daddy.

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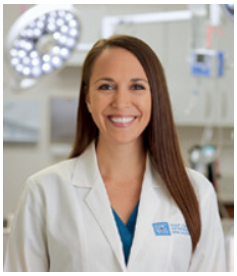

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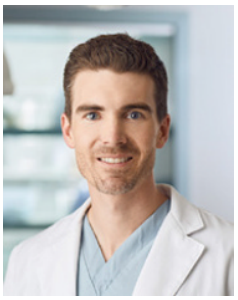

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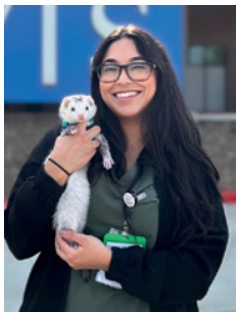

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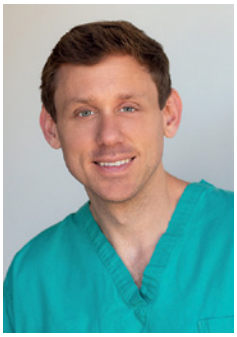

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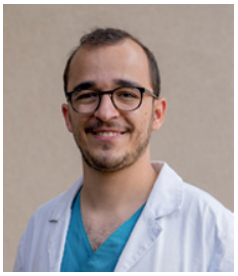

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Foreword

The year was 2010 at the end of spring semester. As a professor of surgery, I was engaged in one of the most important but lifeless and mundane tasks of giving practical skills exams to sophomore students. I remember so distinctly the young woman who leaned in before tying her first knot and declared, "I want to be a surgeon." Such a statement was not rare, and when I perceived it to be sincere, I often offered to have the student come to the clinic operating rooms and scrub in as a table nurse. Most students would show up a few times and disappear. This young woman checked the schedule daily and came after class or during lunch - changing into scrubs, scrubbing in and then out, changing back into classroom clothing, and returning to class as time demanded - for the entire semester and following year. She also requested a letter of reference for a scholarship and I asked for a CV to work from. Surprisingly then (not now), her CV revealed a person of intensity, excellence, and uncommon achievement (many new assistant professors would have been proud of such a CV), and of course, this was my introduction to the Editor of this surgical textbook, Kristin Ashley Coleman.

Although Dr. Coleman's partial biography is online, it is my prerogative to detail it a bit more in this Foreword. Dr. Coleman externed at the Animal Medical Center in the Interventional Radiology Department, which was a catalyst for her love of MIS. She preceptored before graduation at a clinic in which I occasionally consulted. The owner reported that although Kristin was not antisocial, she was "hard put to spend time having fun since she had not finished reading both volumes of Slatter's Textbook of Small Animal Surgery." That clinic also served the veterinary needs of an oceanarium and through these connections, then student Coleman and I (with others) had an opportunity to design and perform the first reported mastectomy on a sea lion for mammary cancer. She returned to the AMC for an internship and then on to Colorado State University for residency and her master's degree.

Post residency, Dr. Coleman joined a private practice in New York City and became board-certified by the American College of Veterinary Surgeons (SA, March 2017). She then moved to Houston with the Gulf Coast Veterinary Specialists in 2019. Succinctly stated, she has had the opportunity to travel very broadly and witness the human condition. As a practitioner specialist, her interests continued in minimally invasive techniques and development of practitioner / generalist continuing education. At least partially motivated by altruism, she knows the pressure on owners and their veterinarians when specialty care exceeds an owner's ability to pay. The burden falls back to their veterinarian. When the managing editor of Wiley suggested that Dr. Coleman assemble authors for a photo-rich, broad-base manual somewhere between a text and an atlas, filled with 'tips and tricks' of soft tissue, orthopedic and ophthalmic surgical techniques, I knew it would be well done. Congratulations reader on your purchase.

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Preface

Once upon a time in vet school, I believed that only board-certified surgeons could perform surgery on animals beyond a sterilization procedure. It was not until I was under the guidance of some of the amazing surgeons from my residency at CSU VTH, Dr. Clara Goh, Dr. Howie Seim, and Dr. Ross Palmer, who invited me to participate in teaching CE events and opened my eyes to the possibility of teaching general practitioners some of the more complicated surgical procedures. The philosophy was that the world is changing; there is an ever-increasing pet population, and board-certified surgeons are not always within traveling distance to a pet in need of surgical intervention, are not always affordable, and are not always available in a timely manner. For these reasons, general practitioners might be asked by their clientele to perform surgeries with which they may not be familiar or may find that they are uncomfortable with the procedures they are already doing. We all know what it feels like to want to help a patient even when we need significant guidance to do so.

This book is for those practitioners: the ones who want to help their clients, who are asked to perform a surgery they have never performed before, or who simply want a book in hand with a step-by-step guide for how to perform certain commonly encountered procedures for their valued patients and clients. Throughout these 54 chapters, you will find step-by-step instructions with 'tips and tricks' for how to increase the chances of a successful surgical outcome and high-quality pictures and videos to help with understanding the components of each surgery. We have also included ample, relevant pre- and postoperative considerations to ensure that not only is a given surgery carried out in the best possible manner but also that the right decisions can be made both leading up to and following surgery to optimize patient care.

Techniques in Small Animal Soft Tissue, Orthopedic, and Ophthalmic Surgery was written by 35 incredible individuals (mostly board-certified surgeons), who are specialists and experts in their field as well as life-long learners dedicated to educating others to advance the field of veterinary medicine. Although these authors are passionate about surgery and the topics they were invited to write, this book is not all-inclusive. Thanks to other great books already in print with highly detailed pathophysiology of disease processes requiring surgical intervention and with complex anatomy as the primary focus of the text, this book is meant to include a review of these concepts to provide a helpful guide with advice on how to do many surgeries. The reader is strongly encouraged to read other texts, understand the indications for certain surgeries, and perhaps even practice on a cadaver, take a short weekend course for a hands-on training lab, or review videos of these procedures (recommendation: videovet.org) prior to performing them on a client-owned animal.

Even though all chapters in this book were deemed relevant for a general practitioner or a surgeon just out of residency who may not have seen all surgeries being required of them in the real world, we would like feedback on how we did and what you want from a "tips on surgical techniques" book. Which techniques would you like to learn about that we did not include in this edition? Which techniques need more detail or better pictures? We intend for this book to morph over time as procedures, perioperative care, or other recommendations change with updated peer-reviewed literature, and input from our readers is the only way we can create the best guide to practical techniques in surgery as possible.

When I got the phone call from the publishing company inviting me to write a textbook like this, I knew that I could not say 'no', and I knew it meant a lot of hard work. But, just under 2 years after that initial call, we did it. With blood (from the patients, carefully controlled with electrosurgery), sweat, tears, and the creative genius of over 30 incredible colleagues and friends, the "labor of love" is done.

Enough babbling – we hope you enjoy our book! Happy reading!

Acknowledgments

To all of the authors of this book: **thank you**! Being a part of this textbook from ideation to implementation of a handheld book will remain one of my proudest professional accomplishments and is only possible thanks to every one of you.

To those who are going to read this book: **thank you**! I think I speak for all of us when I extend my deepest appreciation to all of you for being the inspiration behind this creation.

About the Companion Website

This book is accompanied by a companion website.

www.wiley.com/go/coleman/surgeries

This website includes:

- Videos
- Figures from the book as PPTs

1

Preparing for an Abdominal Procedure

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Key Points

- Learn thorough preparation of an operating room for a standard abdominal exploratory procedure.
- Learn appropriate preparation of the patient, including surgical clip, scrubbing, positioning, and draping.
- Learn about setting up instrumentation for a standard abdominal procedure.

Introduction

This chapter focuses on the detailed preparation of the patient, operating room setup, instrumentation setup, and intraoperative and postoperative considerations when managing an abdominal exploratory procedure.

Preoperative Steps

Equipment Preparation

Immediately prior to an abdominal procedure, the operating room is set up with the appropriate equipment and instrumentation depending on the type of abdominal procedure (Box 1.1, Figure 1.1). Creating a list of commonly used instruments and surgeon's preferences for a variety of procedures may help with efficiency when setting up an operating room (Figure 1.2). Heating systems should be turned on. Intravenous fluids are spiked and primed. Anesthetic machines are checked for leaks (Figure 1.3), and an induction area is prepared (Figure 1.4) with the necessary materials (Box 1.1).

At this point, the patient has had the appropriate diagnostic imaging and the required blood work, and an intravenous catheter has been placed. Once general anesthesia is induced, the patient is positioned in dorsal recumbency. Monitoring equipment may then be attached, including but not limited to electrocardiogram, pulse oximetry, noninvasive blood pressure, and a capnometer. If a patient's position needs to be adjusted at any point, it is ideal to disconnect the breathing circuit from the patient's endotracheal tube to prevent extubation or tracheal damage.

Skin Preparation

Since the duration of anesthesia correlates with infection rates, preoperative preparation should be thorough but efficient. Clipping should be performed outside of the operating room to minimize contamination. The technician should wear exam gloves while clipping. With a #40 clipper blade, shave the patient's ventrum cranial to the xiphoid (mid-thorax), caudal to the pubis, and lateral to the mammary chain (Figure 1.5). Be sure to watch the temperature of the clipper blade. If the blade becomes palpably hot, either replace the blade or spray it with a cooling lubricant. In areas with friable, thin skin, it is advised to have steady movements to reduce the risk of unwanted abrasions. After clipping is completed, a vacuum can be used to pick up loose hair.

Techniques in Small Animal Soft Tissue, Orthopedic, and Ophthalmic Surgery, First Edition. Edited by Kristin A. Coleman.

Companion website: www.wiley.com/go/coleman/surgeries

Box 1.1 Examples of Equipment and Instrumentation Needed for an Abdominal Surgical Procedure

- Suction unit, hose, and canister
- Electrosurgical unit with equipment (e.g., monopolar cautery pen, bipolar cautery pen, foot switch, ground plate, cautery tip cleaner)
- Vessel-sealing device (e.g., LigaSure™ Atlas or Precise)
- General surgery pack (e.g., surgical gowns, large patient drape, towel drapes, bulb syringe, needle counter box, radiopaque gauze)
- Soft tissue instrument tray (e.g., towel clamps, scalpel handles, needle holders, thumb forceps, dissecting scissors, suture cutting scissors, tissue forceps, hemostatic forceps, bowl)
- Suction tip (e.g., Poole, Frazier, Yankauer)
- Retractors (e.g., Balfour, Senn, malleable)
- Stapling equipment (image within this box) (e.g., hemoclip staples, thoracoabdominal (TA) stapler with cartridge, gastrointestinal anastomosis (GIA) stapler with cartridge, skin staples)
- Laparotomy sponges
- Kick bucket
- Light handles
- Sterile gloves
- Suture
- Blades (#10, #11, and #15)

Stapling equipment cart

- Other instruments (e.g., antimicrobial incise drape, biopsy punch, hemostatic products, surgical drain, bladder cystotomy spoon, urethral catheters, sterile lube, sterile syringes, needles, stomach tube)
- Specimen collection (e.g., Formalin, culture, glass slides)

(a)

(b)

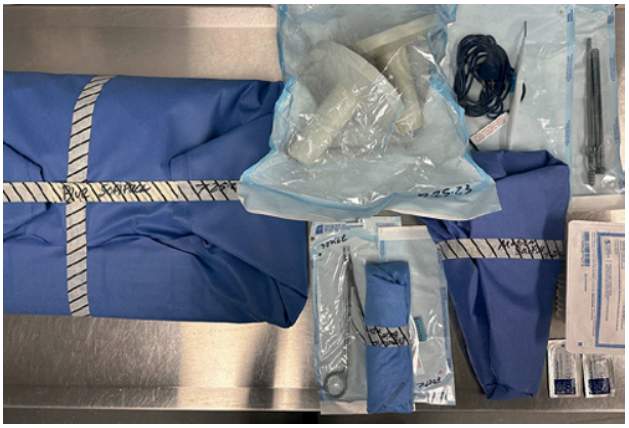


Figure 1.1 (a) Equipment and instrumentation in the operating room. (b) Instrumentation for an exploratory laparotomy laid out.

Male

The cranial and lateral shave margins will remain the same. The caudal clip should extend to the scrotal region in dogs, and if a urology procedure is being performed in cats, the caudal clip should extend dorsal to the prepuce. When shaving around the prepuce, care should be taken near the mucocutaneous junction to not nick the edges. After the clipping is complete, the prepuce should be flushed with diluted povidone-iodine using a syringe. This is done by grasping the edge of the prepuce, inserting the syringe tip, pinching the prepuce, and then injecting the povidone-iodine (Figure 1.6). While still pinching with one hand, massage the prepuce with the other hand to loosen any debris. Place an absorbent pad over the prepuce and expel the flush. This is repeated three times or until the flush is clear.

Female

In urology procedures, include the vulva in your shaving margins for intraoperative catheterization.

Splenectomy/Pyometra

- Soft pack/cautery/light handles
- (2) Poole suction tip
- Balfour
- Blue hemoclip set
- Ligasure
- ABD pads
- 4 mm biopsy punch
- Vetspon
- Extra brown tray

Dr. [redacted]
- LigaSure instrument tray
- Soft Gauze

Dr. [redacted]
- [redacted] Ligasure
- Left-Handed needle drivers

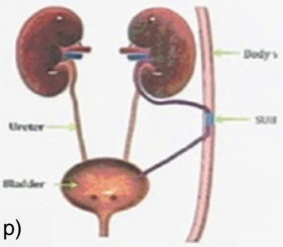
Dr. [redacted]
- Duraprep/loban

Position: Dorsal recumbency

Subcutaneous Ureteral Bypass (SUB Port)

- Soft pack/cautery/light handles
- Poole suction tip
- Balfour
- Sharp senn
- Micro-Cooley needle driver
- Extra Sm towel clamps
- Malleables
- Patient drape
- C-arm drape
- Sterile skin glue
- Sub-port kit system per surgeon

- ABD pads
- CTA's
- 3-Way stop-cock
- Luer lock T-Port (Ax room)
- (3) 6 cc syringe
- 22 g IV catheter (Sm p) or 18g (Lg p)
- 3–0 Monocryl
- 3–0 Prolene
- Omnipaque - Please let O.R Tech know
- Syringe and needle (P dependent 1ml/pound Ex: P 10 pounds = 12 cc Syringe)



Position: Dorsal recumbency
Reminder: Normal Ex-Lap shave/need ***C-Arm & Table***

Figure 1.2 Example of a procedure instrument list.

Figure 1.3 Anesthetic machine, intravenous fluids, monitoring equipment, and heating systems ready to be used.

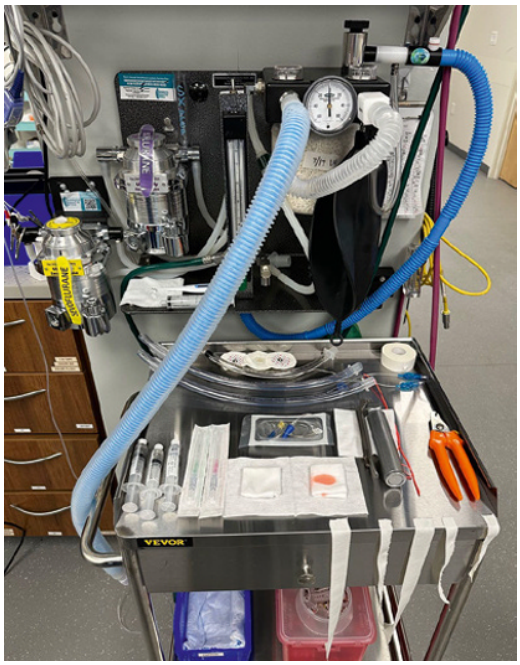


Figure 1.4 Induction area prepared.

Figure 1.5 Patient has been shaved. Supplies for a "dirty" scrub are laid out.

Figure 1.6 A syringe filled with diluted povidone-iodine being inserted inside the prepuce.

The technician should replace their gloves for the "dirty" scrub. Have two stacks of nonwoven gauze set aside. Keep one stack dry and the other one mildly dampened with water (Figure 1.5). Lightly pour chlorhexidine scrub onto the dampened gauze. Begin scrubbing from the center of the abdomen and continue moving outward in a spiral course until the shaved region has been covered. Avoid an aggressive scrubbing motion to reduce the risk of skin irritation and inflammation. Follow it with the dry gauze to clear excess lather. This combination is repeated a minimum of three times or until the gauze no longer contains visible debris. For long-haired patients, water or ultrasonic gel can be used to push the hair down to keep it away from the surgical field.

Transportation into the Operating Room

It is recommended to use a gurney as it is considered the safest method of patient transportation. The patient is moved onto the operating table and is placed in dorsal recumbency. The breathing circuit is once again connected to the patient, with oxygen and anesthetic gas turned back on. If the anesthesia machine has both sevoflurane and isoflurane capabilities, be sure that the correct gas is selected. Monitoring equipment, intravenous fluids, and heat support are applied to the patient (Figure 1.7). The anesthetist can administer the prophylactic antibiotic injection around this step or 30–60 minutes before the incision is made.

Figure 1.7 Patient is positioned on the operating room table with additional heat support provided by warmed bags of fluids and rice.

Positioning

Using a V-top operating table can help keep patients in dorsal recumbency. If using a flat-top table, a V-trough or sandbags can be used to assist in patient stabilization. To keep the sternum centered and prevent shifting, the patient's limbs should be secured with tape, ropes, or leashes. Distal limb perfusion is improved by spreading the forces applied circumferentially to the extremities. Caution should be exercised to prevent overtightening of the limb (Figure 1.8).

Figure 1.8 Patient's limbs safely secured.

Sterile Scrub

Patient is now ready for sterile preparation. Remove the cap from the sterile saline bottle and have chlorhexidine scrub set to the side. Open a sterile bowl containing a stack of sterile nonwoven gauze. Apply a sterile glove to the dominant hand only. Split the sterile gauze into two stacks with the dominant hand, leaving one stack inside the bowl and keeping the other stack dry outside of the bowl (Figure 1.9). With the nonsterile hand, pour sterile saline into the bowl until the gauze is well dampened. Lightly pour chlorhexidine scrub onto the dampened gauze. With the dominant hand, begin scrubbing from the center of the abdomen and continue moving outward in a spiral course until the shaved region has been covered. Do not scrub toward the center of the abdomen after touching any hair on the periphery; simply throw away that gauze after contacting the hair. Each chlorhexidine swipe should last approximately 60 seconds to allow adequate contact time, before wiping off with the sterile dry gauze. This combination is repeated a minimum of three times. If hair is touched, restart the count. Ensure the abdomen is completely dry prior to the surgeon starting surgery, especially if using alcohol-based scrub.

Draping

Open the general surgery pack (Figure 1.10) and the soft tissue instrument tray (Figure 1.11). Lay out a sterile gown and gloves for the person scrubbing in (Figure 1.12). From this point, each of the following tasks should be performed with the intent of avoiding contamination. Utilize a "four-quarter-drape" technique using the sterile surgical towels on the abdomen. Stepping away from the sterile field, open and hold a surgical towel. Use both hands to fold the top of the longest side away from the sterile assistant. Position each hand on the corners and wrap the towel around them, creating a cuff.

Figure 1.9 Supplies for a sterile scrub.

Figure 1.10 General surgery pack.

Figure 1.11 A soft tissue instrument tray.

Figure 1.12 A surgical gown and gloves opened.

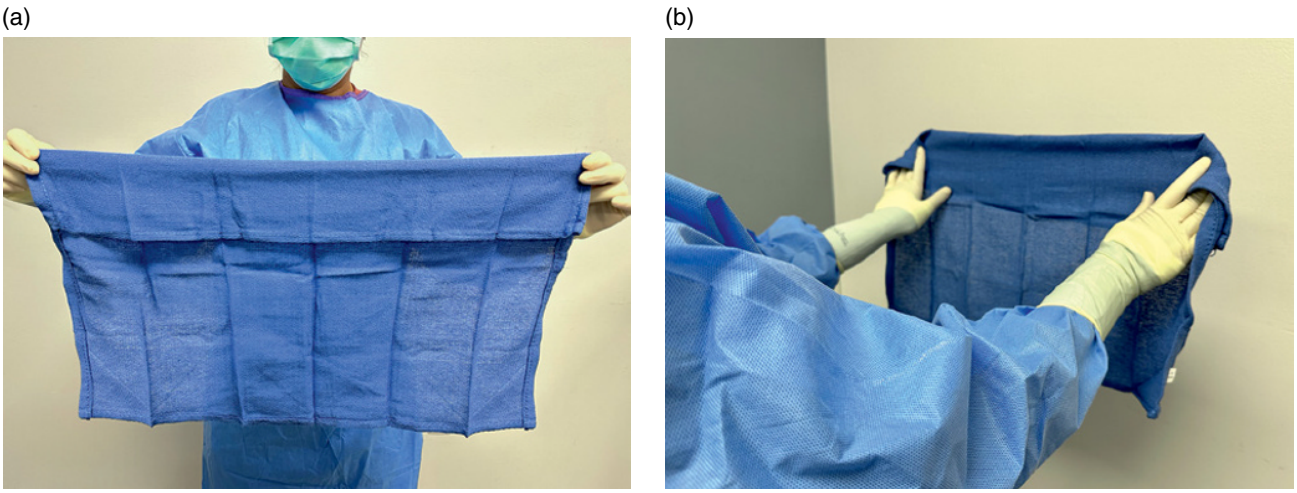


Figure 1.13 Folding of a towel drape. (a) Top of the drape is folded. (b) Drape is wrapped around each hand.

This will protect the sterile glove from contacting the patient while draping (Figure 1.13). While making sure the surgical gown does not touch the unsterile part of the table, place a towel cranially, caudally, then on the side nearest to the sterile assistant first, before placing a towel on the farthest side away from the assistant. Placement of the towels should be approximately 1-inch from the clipped hair. Sterile towels should not be dragged inward after being laid down, as this would no longer be considered sterile due to cross contamination. The corners where the towels meet should overlap each other. Next, place the towel clamps about 5 mm from the lateral aspects of the towel, penetrating both the towel and epidermis. Each towel clamp should only be tightened to the first ridge. Towels should be even and taut to prevent hair from entering the sterile field. For male patients, use a towel clamp to move the prepuce out of the surgical field away from the surgeon's side (Figure 1.14), unless the surgery involves assessing the urinary tract.

Figure 1.14 The prepuce is moved out of the surgical field using a Backhaus towel clamp.

A large patient drape sheet is then placed on top of the patient. Keeping one hand on the patient drape, start unfolding cranially and caudally, including the sterile instrument table to create one big sterile field. Open the drape toward the sterile assistant. Next, use both hands to spread open the rest of the drape while avoiding contact with the non-sterile table with the front of the sterile gown (Figure 1.15). Refrain from cutting a hole on the patient drape until instrumentation has been set up to reduce skin exposure.

Surgical Instrument Table

The patient and surgical instrument table should now be draped. Before an extra protective layer is added on top of the instrument table with a huck towel, any cord (e.g., monopolar or bipolar cautery and LigaSure) can be laid out and passed off to the circulating technician toward the back of the table to be plugged into their respective power sources. The towel drape will help the cords stay hidden and prevent them from getting in the way intraoperatively (Figure 1.16). If suction or any other connections are at the front end of the patient table, secure them with a spare traumatic forcep, like an Allis tissue forcep. Avoid using an atraumatic forcep, like a mosquito hemostatic forcep, to prevent the more delicate instruments from being damaged.

The soft tissue tray can now be placed on the instrument table with the rings of the instruments facing the surgeon. Instrumentation should be set out in the order that it will be utilized, and the dexterity of the surgeon should be considered (i.e., left- versus right-handed). A set of spare clean instruments (e.g., needle drivers, tissue forceps, and suture scissors) with new sterile gloves for the surgeon should be set to the side in "clean-contaminated" cases, such as gastrointestinal procedures, to reduce cross contamination (Figure 1.17). The circulating technician may begin