Marios Loukas
R. Shane Tubbs
Brion Benninger

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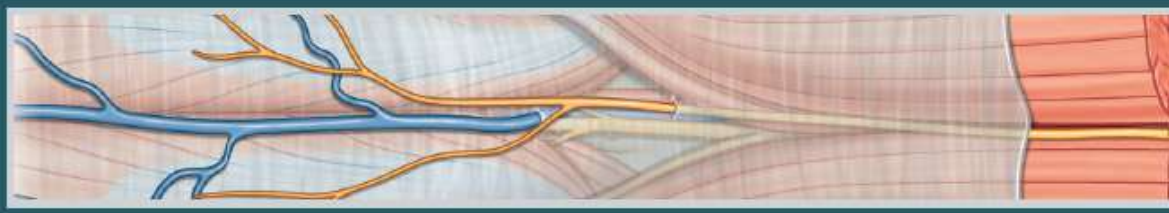
GRAY'S CLINICAL PHOTOGRAPHIC DISSECTOR OF THE HUMAN BODY



Second Edition

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GRAY'S CLINICAL PHOTOGRAPHIC DISSECTOR OF THE HUMAN BODY

Second Edition

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I would like to dedicate this book to my brilliant and wonderful wife, Joanna, who has been the bright star of my life. Her continuous support, dedication, love, and affection give me the energy and courage to fulfill all of our dreams.

ML

I would like to thank my wife, Susan, and son, Isaiah, for their support and patience during the writing of this dissector. All that I do, I do for them. I also want to dedicate this book in memory of my brother-in-law, Nelson Jones, whose intellect, engagement of others, and curiosity about life have been examples for me.

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BB

Credits

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Plates 5.1, 6.1 to 6.4, 12.1, 13.1, 18.1, 22.3, 23.3, 24.3, 24.4, 26.1

Preface

Dissection of the human body, even in the twenty-first century, continues to be the best way of learning the intricacies of the human body. The tactility involved with dissection and the variations in structures between specimens allows the student to gain a much deeper appreciation of human morphology. However, as the time allotted for anatomical education continues to be whittled down in most curricula, courses must continually evolve. Therefore, courses that continue to dissect the human cadaver must utilize all available time wisely. Traditionally, in most anatomy courses that use cadavers, students begin their dissections with the aid of a dissector and follow step-by-step instructions of how to dissect the human body. Such guides, in general, are written much like cookbooks and usually do not provide students with a pictorial step-by-step guide of what to expect during their exploration of the human body. When figures are used by such resources, they are almost always schematic drawings that often look nothing like the actual anatomical structures that are seen by the students. It is this deficit in the extant literature that compelled us to compile dissection photographs with accompanying text to better assist the student of anatomy. It is our hope that being able to see what students are expected to find during their dissection, from superficial to deep, will allow them to be more efficient not only in their learning experience but also with their time.

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†Deceased.

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CHAPTER 1 DISSECTION LABORATORY MATERIALS, TOOLS, AND TECHNIQUES

Using appropriate dissection laboratory materials and tools is essential in making the dissection of a cadaver as rewarding as possible. Many experienced dissectors have their favorite tools. Obtaining the following materials and dissection tools allows dissectors to care for their cadaver donor while acquiring experience and knowledge of a successful dissection. Although not comprehensive, this list provides appropriate tools to dissect a cadaver donor in the anatomy teaching laboratory.

MATERIALS

Cadaver Materials

- Blocks
  Plastic or wooden blocks of different shapes and sizes (6–18 inches) can be used to position the cadaver (Fig. 1.1).
- Stands
  Removable stands that either bridge or attach to dissection tables are useful for holding dissection guides, texts, and atlases for dissection.
- Plastic sheets
  Plastic sheets can be used to cover the cadaver, which usually comes with a shroud and a cotton sheet. This helps maintain moisture within the cadaver, to prevent drying, and to allow dissection of appropriately hydrated tissues.
- Cotton sheets
  Surgical green or blue sheets covering a plastic sheet help preserve the cadaver and create a professional working environment.
- Spray bottle with wetting solution
  An individual plastic spray bottle (1 quart) at each cadaver station allows dissectors to maintain good-quality tissue (see Fig. 1.1). An alternative is a 2- to 3-gallon pressure spray unit shared among the dissection laboratory stations.
- Holding container
  The plastic 5- to 10-gallon container with a spigot stores cadaver hydration solution.
- Cadaver hydrating solution
  Several types of mixtures are available to hydrate and maintain cadaver tissue. The authors use a solution with 3000 mL of propylene glycol, 500 mL of ethyl alcohol, and 300 mL of fabric softener, in a 10-gallon holding unit, with the remainder filled with water.
- Cadaver bag
  The bag helps to maintain hydration of the cadaver (Fig. 1.2).

Dissector Materials

- Scrubs
  Comfortable clothing also can be worn with scrubs or under a lab coat.
- Disposable shoe covers
  Shoe covers protect shoes worn in the laboratory during dissection and can be disposed of on exiting the lab, ensuring cleanliness inside and outside the laboratory (Fig. 1.3). Closed-toed shoes should be worn in the dissecting laboratory.
- Goggles
  Protective safety goggles or glasses should be worn at all times during dissection (see Fig. 1.3).
- Face shields
  Shields can be worn when using bone saws or when excessive fluids are present (see Fig. 1.3).
- Gloves
  Gloves vary in the type of synthetic material used; powdered gloves and powder-free gloves are available. (Fig. 1.4). Offer both types to protect dissectors with

Fig. 1.1 Red and blue latex wrap (to keep cadaver moist); spray bottle; plastic and wooden blocks.

Fig. 1.2 Cadaver bag and cloth measuring tape; ball of string; digital calipers.

different skin sensitivities. *Double gloving* helps to prevent contact with cadaver embalming fluids, which may irritate sensitive skin.

- First-aid kit
  In a dissection laboratory, nicks and pricks are inevitable, so an up-to-date first-aid kit is essential. It should contain adhesive strips (e.g., Band-Aids), cleansing solutions (e.g., hydrogen peroxide), gauze rolls/pads, and eyewash solution. The phone number of the lab director and/or physician should be posted on a wall inside the lab so that users can contact them to answer any emergency issues that may arise if students are allowed to dissect during nonformal hours.

Dissection Tools

- Cloth/measuring tape
  A cloth or paper measuring tape can be invaluable when measuring distances from landmarks of surface anatomy (see Fig. 1.2).

Fig. 1.3 Disposable hair and shoe covers; mask with eye shield; goggles.

Fig. 1.4 Laboratory gloves differentiated by powder and powder free, latex and latex free.

- Skin marker
  Marking pens can be helpful tools for tracing out the incision before dissection. Markers can also be used to highlight surface anatomy (Fig. 1.5).
- Disposable scalpels
  Disposable scalpels have an advantage because the blade is already secured to the handle. Have a disposable sharps bin in the laboratory (see Fig. 1.5).
- Scalpel handles and blades
  Metal scalpel blades are relatively standardized. Many different blade shapes and sizes are available; however, dissectors should experiment to determine which best suits them and the targets to be dissected. The authors prefer larger blades for their students. Scalpels are used primarily to make skin incisions but also can be used to reflect the dermis and areas with dense connective tissue.

Fig. 1.5 Various scalpel blades and handles (metal and disposable scalpels). An example of a skin marker that can be used for outlining skin incisions is shown.

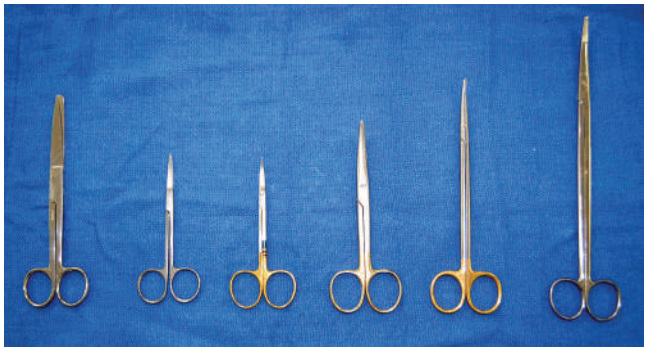

Fig. 1.6 Various scissors differentiated by length and blade type (straight or curved, pointed or blunted): 6-inch Deaver, straight fine scissors, curved fine scissors, 5-inch Mayo, 7-inch Metzenbaum, 9-inch Metzenbaum.

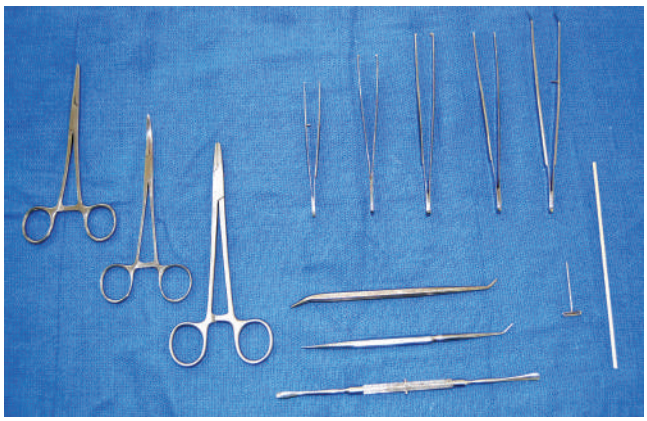

Fig. 1.7 *Left,* Hemostat or artery clamps (straight and curved). *Upper,* Needle holder; various forceps differentiated by length, toothed and nontoothed. *Lower,* Probes and dissectors. *Right,* T-pin and orange stick.

- Sharps bin or container
  For safety compliance, all dissection laboratories should have a sharps bin to dispose of scalpel blades, disposable scalpels, pins, and needles.
- Scissors
  Both 5-inch and 7-inch straight and curved scissors may be used. It is important that the scissors used for each dissection are appropriate in size (Fig. 1.6). Generally, head and neck dissection can be conducted with 5-inch scissors. The remainder of the body can be dissected with 7-inch scissors. The classic scissor dissection technique is a *reverse dissection.* Straight and curved scissors tend to be user specific.
- Hemostat clamps
  Corrugated and smooth, 5-inch and 7-inch hemostat clamps are available (Fig. 1.7). The corrugated type can be used to clamp onto the edge of skin incisions to aid in flap removal. Smooth clamps can be used to hold onto delicate structures during dissection. Hemostat clamps can be used when retracting tissue over relatively long dissection periods.
- Needle holders
  The needle holder allows the user to secure and remove scalpel blades (see Fig. 1.7).
- Forceps
  Toothed and nontoothed forceps are either 5 inches or greater than 5 inches long. Toothed forceps enable the dissector to grip tissue without it sliding out of the hands. Nontoothed forceps allow the dissector to control delicate tissues during meticulous dissection without damaging the tissue (see Fig. 1.7).
- Spatula probe/pointer
  Instruments that have a probe or tip on one end and spatula on the other can be used to highlight dissected structures. The spatula can aid blunt dissection (see Fig. 1.7).
- T-pins
  T-pins (1½–2 inches) are useful in securing structures away from the desired dissection region. T-pins also can be used when setting up laboratory examinations (see Fig. 1.7).
- Chisel (osteotome)
  Narrow-blade and broad-blade chisels are important for performing osteotomies and can help dissect, for example, between the occipital condyles and various vertebrae (Fig. 1.8). Chisels can be used to break up a bone surface to view the soft tissue deep to it (e.g., anterior cranial fossa).
- Rubber mallet
  A mallet is used when striking the chisel to crack surface areas, such as when performing osteotomies (see Fig. 1.8).
- Electric Stryker saw
  Used when cutting bone, the Stryker saw has a safety mechanism that prevents the blade from cutting the user's skin and soft tissue.

Fig. 1.8 Handsaws (long and short) for bone; electric Stryker bone saw; chisel (broad and narrow blades); rubber mallet.

- Handsaw
  A simple bone saw can be used to customize various dissections and amputations for plastination (see Fig. 1.8). A handsaw is important for hemipelvectomy dissections.

DISSECTION TECHNIQUES

Using the proper technique during dissection is important when developing good dissection skills. Initially, holding the instruments correctly and practicing the techniques may not feel natural. The authors believe that cadaver dissection techniques should reflect the techniques used during surgical procedures. Learning to hold forceps and scissors is fundamental during dissection. These techniques also can be used in the operating room and certain office settings during interventional procedures.

- Scalpel
  The technique for placing a blade onto a scalpel handle requires a hemostat to hold the blade and then place it onto the handle while holding the forceps (Figs. 1.9 and 1.10). When cutting with the blade, use the tip and the first centimeter of the blade. Direct the scalpel using smooth, sweeping motions (Fig. 1.11). Avoid "sawing" and "woodpecker" techniques. Dull blades that require "pushing" the scalpel are dangerous; therefore maintain a sharp blade at all times.
- Forceps
  Hold the forceps as you would hold a pencil, with a pincer grip. The classic mistake is holding the forceps in the palm of the hand as if grasping. Hold the forceps vertically and perpendicularly to the target tissue to allow a 360-degree window of use (Fig. 1.12).
- Scissors
  The appropriate technique when dissecting with scissors is called *reverse dissection* (Fig. 1.13). This requires the user to keep the scissor blades closed when entering into the tissue to be dissected, then opening the blades to create a splaying of the tissue. This results in natural separation of tissue structures and planes. Cut only tissue that is fully exposed so that the desired tissue can be preserved.
- Buttonhole maneuver
  A buttonhole maneuver is helpful when dissecting a flap of dermis. Create a 2-cm parallel incision along the original skin incision, 2 to 3 cm from the edge.

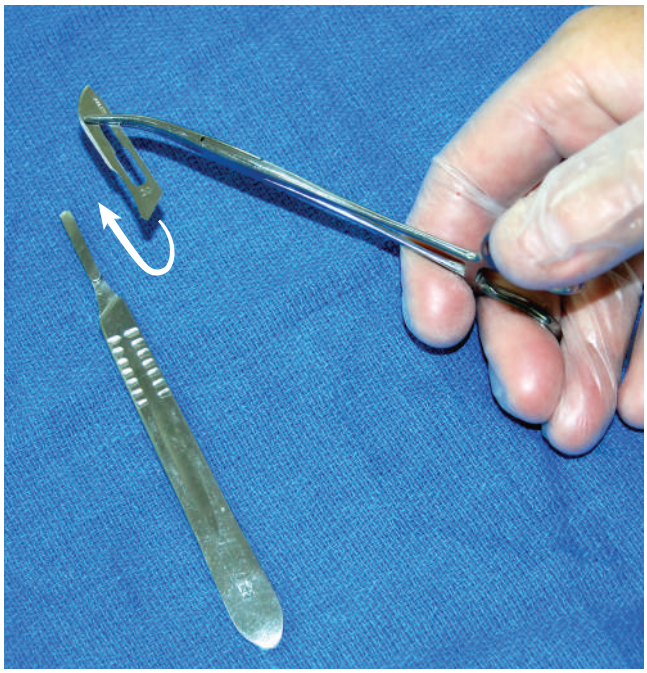

Fig. 1.9 Placing or replacing scalpel blades onto a scalpel handle. Use hemostat or needle holder to grip the scalpel blade. Line up the base angle of the blade with the tip-of-handle angle.

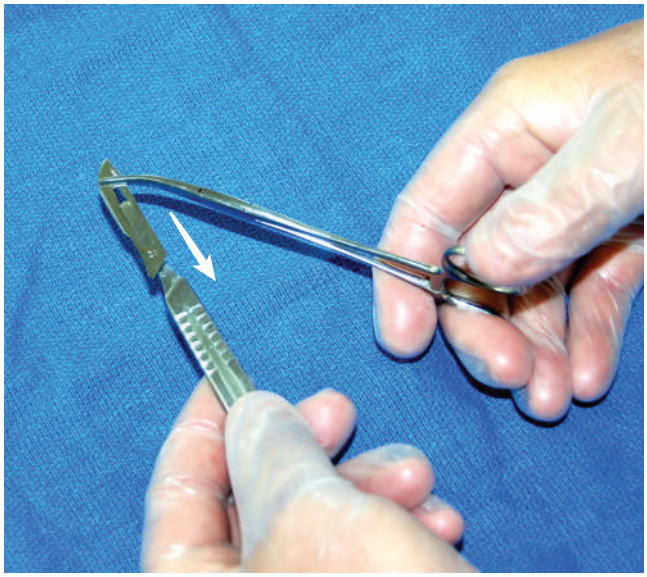

Fig. 1.10 Placing the blade onto the scalpel handle tip. Generally, a clicking sound confirms the blade is secured correctly.

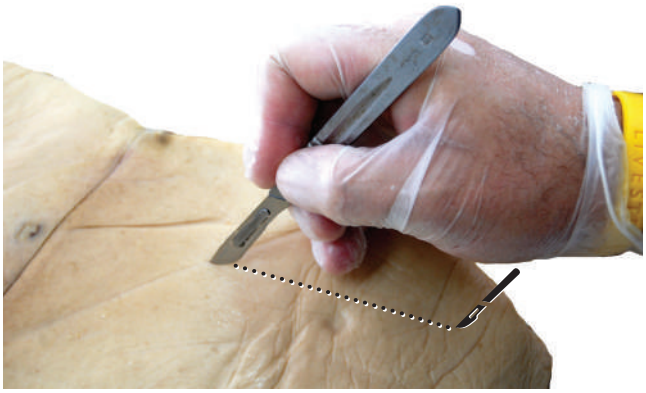

Fig. 1.11 Using the scalpel tip to create skin incisions. Note the grip of the scalpel provides side-to-side and back-to-front blade stability.

Fig. 1.12 Holding toothed forceps with a 360-degree view and using the scalpel tip between tissue layers while maintaining tension of superficial tissue layer.

Fig. 1.13 Blunt dissection introduces the scissor tips into the tissue, and then reverse dissection opens the tissue planes.

Fig. 1.14 The buttonhole maneuver is helpful when dissecting large skin flaps and provides appropriate tension to expedite dissection. Place your fingertip(s) into the parallel incision and retract with appropriate tension.

Fig. 1.15 The buttonhole maneuver for retraction of the skin allows adequate visualization of the underlying tissue for further dissection.

Repeat this, generally near the corners of the skin flap. Place your index finger into the parallel incision, and retract the skin flap with appropriate tension that would allow either blunt dissection or a sharp edge to cut the apex of the flap (Figs. 1.14 and 1.15).

- Surface fracturing technique

  The surface fracturing technique requires placing the broad blade of a chisel parallel to the bone and with as much of the blade along the bone. Strike the chisel head with a mallet using a technique that does *not* follow through once the head is struck. The objective is to direct the energy through the blade onto the