Dr. Pestana's Surgery Notes

FIFTH EDITION

Top 180 Vignettes of Surgical Diseases

- Highest-yield review for the surgical clerkship and shelf exams
- Reliable prep for USMLE® Step 2 CK

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About the Author

Carlos Pestana, MD, PhD, is currently an emeritus professor of surgery at the University of Texas Medical School at San Antonio. A native of the Canary Islands, Spain, Dr. Pestana graduated from medical school in Mexico City, ranking #1 in his class, and subsequently received a doctorate in surgery from the University of Minnesota, in conjunction with a 5-year surgical residency at the Mayo Clinic. Throughout his career, he has received over 40 teaching awards and prizes at the local, state, and national levels, including among the latter the Alpha Omega Alpha Distinguished Professor Award from the Association of American Medical Colleges, and the National Golden Apple from the American Medical Student Association.

In the late 1980s and early 1990s, Dr. Pestana was a member of the Comprehensive Part II Committee of the National Board of Medical Examiners, which designed what is now the clinical component of the Licensure Examination (Step 2 of the USMLE®), and he also served for 8 years as a member-at-large of the National Boards.

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Preface

The front cover says “Surgery Notes.” Your curiosity is aroused: “I always wanted to know how an appendectomy is done. Let me look inside and find out.” You will not encounter that information. Surgeons obviously have to know that, but this little book was written for medical students and physicians preparing to take a licensure exam. For those purposes, you have to understand surgical diseases—to know when to operate and which procedure is indicated—but not exactly the technical steps.

Surgeons themselves recognize that the most important thing they do is to choose the *who* and *when* and *what*, rather than the how. Although surgeons take great pride in providing flawless execution, which is of course terribly important, they dismiss it out of hand with the classic joke: “You could teach a monkey how to operate.”

But before we leave the operating room, let’s look at what goes on in there with a brief historical perspective.

By around 1910, virtually all our surgical armamentarium had been developed, mostly in Western Europe. The last two areas, open-heart surgery and transplantation, were added around the mid-1900s. As they pertained to the two major body cavities, the abdomen and the chest, they were approached via large incisions. That “open” route provided good exposure, allowing the surgeon and assistants to use normal hand motions. Not only could they see what they were doing, but they also could feel the structures being dissected. Stones could be palpated, pulsations detected. When unexpected bleeding arose, direct pressure could instantly stanch it while additional help was summoned. It worked.

But it worked at a price—paid by the patient, as a true story from my days at the Mayo Clinic illustrates. Dr. C. W. Mayo, with his retinue of residents, students, and nurses, was making rounds on a postoperative patient. Pointing to the long, recently sutured abdominal incision, Dr. Mayo praised the virtues of generous access. “Make them big,” he said. “They heal from side to side, and not from end to end.”

At which point the patient interjected, “Yes, but they hurt from end to end.”

Indeed they did. And a laparotomy was not the worst. The traditional approach to the chest, a posterolateral thoracotomy, was the most painful incision that could be inflicted on a human being. Every breath afterward was pure agony.

Unknown to the patients, and mostly ignored by the physicians, was the other cost of those big cuts: They were destructive. The vast majority of metabolic response to trauma often came from the incision itself rather than from what was done inside.

The stage was thus set for the revolution that began in the second half of the 20th century and continues to this day: minimally invasive surgery.

Consider the example of laparoscopic surgery: Carbon dioxide is insufflated into the abdomen to make room to conduct the procedure. A thin tube with a TV camera and a light source—a laparoscope—is introduced through a tiny incision, and the area to be worked on appears on a TV screen. Additional probes are then added through other ports to do the actual operation, with scissors, staplers, cautery tips, and so on, at the working end of those long sticks. Moving these ingenious instruments requires complex, unnatural motions both to position the tip and to activate the various functions—requiring the surgeon and assistants to master new skills of hand-eye coordination.

There is no palpatory input, the image is two-dimensional, and if anything goes wrong the belly has to be opened. In planning for a laparoscopic procedure, it is made clear to the patient that old-fashioned open surgery is the standard. Every effort will be made to complete everything with minimally invasive techniques, but converting to open is not a complication, an error, or an untoward outcome. It is simply the prudent thing to do if needed.

Proprietary developments have improved the basic procedures. More sophisticated setups allow three-dimensional images, with robotic surgery representing the most expensive and elaborate end of the spectrum. In the latter, the surgeon sits at a console wearing gloves that transmit all the hand motions to a tiny robot that has been previously introduced into the patient. In contrast with the forced, awkward motions of laparoscopic surgery, the surgeon uses enhanced natural movements. The robot, for instance, can rotate more than a human hand can. That little device can twist and turn in every desirable way. Like magic.

But even there, surgeon and patient are in the same room. The little robots can do wonders, but human intervention may become necessary if unexpected problems arise.

In the field of vascular surgery, thoracotomies and laparotomies are nowadays often replaced by endovascular procedures, in which a stent is introduced via the femoral artery and then advanced under x-ray guidance and fixed in the location where a major vessel needs to be repaired.

Let’s leave the operating room for now, and direct our attention to the contents of these surgery notes. For several decades, I ran a course at the San Antonio medical school that prepared our students to function in the surgical wards and confront their exams. To facilitate those tasks, I wrote a pocket manual for them—a humble, homemade product, distributed at no cost. Somehow, that booklet was posted on the Internet, and to my delighted surprise students all over the nation were downloading and praising it. That was the forerunner of this little book, currently enhanced by the editorial input of Kaplan, and regularly updated.

This is not a substitute for learning “on the job.” Your professors, your residents, and your patients will be your best teachers, along with the library, standard textbooks, and your computer. (You just need to remember one word: “Google.”) But the clerkship does not expose you to every surgical disease, and there will be times when you need a quick answer. Keep my notes in your white coat, with the lab slips and the granola bars. There is a lot of information in here.

I will now move on to address an issue that I have never seen covered in any other publication or medical school lecture. Surgery is an art, more than a science. There are multiple ways to diagnose and treat patients: regional variations, institutional preferences, evolving criteria. Students are bewildered when they read two different books and are given different advice. They want to know which is the correct answer for the exam.

Let me share a little secret with you. The design features of National Board exams stipulate that any given question can have only one correct answer. The distractors obviously have to be believable, but none of them can be true. Thus, if you read in one book that Disease A should be managed with Therapy X, while another text recommended Therapy Y, you have to remember both therapies. One of them will appear on an item dealing with Disease A—but not both. It's against the rules.

What happens if you see two or more “correct” answers in the same question? Did the National Board of Medical Examiners make a mistake? No, they did not. Their quality control is awesome. They are simply testing you at a more advanced, sophisticated level. Hidden in the stem of the question, there is a bit of information indicating that for that particular patient, only one of those answers is acceptable because there is a complicating factor that renders the others unsuitable.

Let's look at an actual example. Go to the back of this book and read question 53. It describes a dissecting aneurysm of the ascending aorta, which can be diagnosed with a sonogram, an MRI, or a CT angiogram. Two of those appear to be correct answers. But the patient in question has a creatinine of 4, indicative of severe kidney disease. Her renal function would be wiped out by the intravenous dye needed to do the CT angio. That would not be good. You have to pick MRI for her.

Which brings us to a little review of those practice questions at the end of the book.

A Note on the Practice Questions

An exam question, from the exam writer's perspective, is designed to conceal the important diagnostic clues among a mass of information that is not particularly relevant to that specific case, thus testing the ability of the well-informed examinee to instantly separate the wheat from the chaff.

The typical exam question starts with age and gender, followed by present complaint, past history, physical exam, and lab or imaging studies. Each of those "chapters" often includes data, whether relevant or not. For instance, the vital signs are always given: temperature, pulse rate, blood pressure, height, and weight. In a trauma patient who is in shock, the pulse rate and blood pressure are extremely important. In a woman with a breast mass, they are not. Personal habits are irrelevant in deciding whether somebody has a brain tumor, but would be virtually diagnostic in someone with a neck mass.

By contrast, **the questions in this book are primarily designed for content review**, and are abbreviated versions of the longer, ritualized format of the actual USMLE or shelf exam questions. They are not cluttered with vital signs or other facts that will not help. Rather, **these questions contain only the key combination of facts** that should be immediately recognized by an astute clinician.

A preface typically ends with words of thanks to those who helped with the text. My gratitude extends first of all to my readers, who, by accepting the four previous editions, made this fifth one possible. Then hats off to the faculty at the San Antonio medical school. They helped me teach the surgery course for many years, and they still keep me on my toes. But I mentioned something about regional and institutional

preferences, which make this discipline an art rather than a science. So, let me recognize the coast-to-coast contributions of the Kaplan Medical faculty: Dr. Adil Farooqui of Los Angeles; Dr. Mark Nolan Hill of Chicago; and Dr. Ted A. James of Boston.

Carlos Pestana, MD, PhD
San Antonio, Texas

Section I

SURGERY REVIEW

Chapter 1

Trauma

Initial Survey (the ABCs)

Airway

An airway is present if the patient is conscious and speaking in a normal tone of voice. The airway will soon be lost if there is an expanding hematoma or emphysema in the neck. An airway should be secured before the situation becomes critical.

An airway is also needed if the patient is unconscious (with a Glasgow Coma Scale of 8 or under) or his breathing is noisy or gurgly, if severe inhalation injury (breathing smoke) has occurred, or if it is necessary to connect the patient to a respirator. If an indication for securing an airway exists in a patient with potential cervical spine injury, the airway has to be secured before dealing with the cervical spine injury.

An airway is most commonly inserted by orotracheal intubation, under direct vision with the use of a laryngoscope, assisted in the awake patient by rapid induction with monitoring of pulse oxymetry, or less commonly with the help of topical anesthesia. In the presence of a cervical spine injury, orotracheal intubation can still be done if the head is secured and not moved. Another option in that setting is nasotracheal intubation over a fiber optic bronchoscope.

The use of a fiberoptic bronchoscope is mandatory when securing an airway if there is subcutaneous emphysema in the neck, which is a sign of major traumatic disruption of the tracheobronchial tree.

If for any reason (laryngospasm, severe maxillofacial injuries, an impacted foreign body that cannot be dislodged, etc.) **intubation cannot be done in the usual manner** and we are running out of time, a cricothyroidotomy may become necessary. It is the quickest and safest way to temporarily gain access before the patient sustains anoxic injury. Because of the potential need for future laryngeal reconstruction, however, we are reluctant to do it before the age of 12.

Breathing

Hearing breath sounds on both sides of the chest and having satisfactory pulse oximetry establishes that breathing is okay.

Shock

Clinical signs of shock include low blood pressure (BP) (under 90 mm Hg systolic), fast feeble pulse, and low urinary output (under 0.5 mL/kg/h) in a patient who is pale, cold, shivering, sweating, thirsty, and apprehensive.

In the trauma setting, shock is caused by either bleeding (hypovolemic-hemorrhagic, by far the most common cause), pericardial tamponade, or tension pneumothorax. For either of the last two to occur, there must be trauma to the chest (blunt or penetrating). In shock caused by bleeding, the central venous pressure (CVP) is low (empty veins clinically). In both pericardial tamponade and tension pneumothorax, CVP is high (big distended head and neck veins clinically). In pericardial tamponade, there is no respiratory distress. In tension pneumothorax, there is severe respiratory distress, one side of the chest has no breath sounds and is hyperresonant to percussion, and the mediastinum is displaced to the opposite side (tracheal deviation).

Management of pericardial tamponade is based on clinical diagnosis (do not order x-rays—if diagnosis is unclear choose sonogram), and centered on prompt evacuation of the pericardial sac (by pericardiocentesis, tube, pericardial window, or open thoracotomy). Fluid and blood administration while evacuation is being set up is helpful.

Management of tension pneumothorax is also based on clinical diagnosis (do not order x-rays or wait for blood gases). Start with big needle or big IV catheter into the affected pleural space. Follow with chest tube connected to underwater seal (both inserted high in the anterior chest wall).

Management of hemorrhagic shock includes two components: stopping the bleeding and replacing the lost blood.

Bleeding from the extremities is controlled by direct pressure in the single civilian patient who shows up in a fully staffed emergency room. When there are multiple injured people in either the military or civilian setting, we resort to tourniquets.

Internal bleeding in someone who happens to be near a trauma center is best dealt with by surgery followed by the replacement of the lost blood. But if the patient or patients are far away from hospital facilities, by necessity we have to start replacing the blood volume as we transport them, as quickly as possible, to where the lifesaving operation can be done.

Intuitively, we know that the best replacement for lost blood is whole blood. The military has extensive experience with that notion. Soldiers are excellent blood donors who willingly come to the help of their injured comrades. In the civilian setting, we have not been so fortunate. Blood is a scare resource, and thus blood banks break it into its various components to make better use of it. Historically, if we wanted to give whole blood, we had to reconstitute it by mixing packed red cells, fresh frozen plasma, and platelet packs in a 1-1-1 ratio.

Think about that for a moment: What comes out of a blood donor is whole blood. We go through effort and expense to break it down, and then take more steps to put it together again for a seriously injured patient. Weird.

That is beginning to change. The management of trauma is becoming a highly organized effort, with areas of the country allotted to Level 1 centers and appropriate transportation provided. Many of those ambulances and helicopters now carry whole blood from universal donors to be given as the resuscitation fluid en route. The survival improvements have been so dramatic that we may soon have no further use for Ringer lactate or blood components in the severely injured.

Preferred route of fluid resuscitation in the trauma setting is two peripheral IV lines, 16-gauge. If they cannot be inserted, percutaneous femoral vein catheter or saphenous vein cut-downs are alternatives. In children under 6 years of age, intraosseus cannulation of the proximal tibia is the alternate route.

Brief detour: Shock in the nontrauma setting

Shock can be hypovolemic, from bleeding or other massive fluid loss (burns, pancreatitis, severe diarrhea). The classical clinical signs of shock will include a low CVP. Treat the cause, and replace the volume.

Intrinsic cardiogenic shock can happen with massive infarction or fulminating myocarditis. In this case the clinical signs will come with a high CVP, a key identifying feature. Treat with circulatory support.

Vasomotor shock is seen in anaphylactic reactions and high spinal cord transection or high spinal anesthetic. Circulatory collapse occurs in flushed, “pink and warm” patient. CVP is low. Pharmacologic treatment to restore peripheral resistance is the main therapy (vasopressors). Additional fluids will help.

Septic shock includes all three components. Early on, low peripheral resistance and high cardiac output predominate. Later, cardiogenic and hypovolemic features are seen. In addition to antibiotics, the initial treatment often includes a steroid bolus. Patients who respond beautifully at first but then suffer a relapse might not have septic shock at all, but rather **adrenal insufficiency**. It is not common, but you will look very smart if you make that diagnosis.

A Review from Head to Toe

Head Trauma

Penetrating head trauma as a rule requires surgical intervention and repair of the damage.

Linear skull fractures are left alone if they are closed (no overlying wound). Open fractures require wound closure. If comminuted or depressed, they have to be treated in the operating room (OR).

Anyone with head trauma who has become unconscious gets a computed tomography (CT) scan to look for intracranial hematomas. If negative and neurologically intact, they can go home if the family will wake them up frequently during the next 24 hours to make sure they are not going into coma.

Signs of a fracture affecting the base of the skull include raccoon eyes, rhinorrhea, and otorrhea or ecchymosis behind the ear. Expectant management is the rule. From our perspective, the significance of a base of the skull fracture is that it indicates that the patient sustained very severe head trauma, and thus it requires that we assess the integrity of the cervical spine. This is best done with CT scan, usually as an extension of the scan that is done for the head. Remember also that nasal endotracheal intubation should be avoided in these patients.

Neurologic damage from trauma can be caused by three components: the initial blow, the subsequent development of a hematoma that displaces the midline structures, and the later development of increased intracranial pressure (ICP). There is no treatment for the first, surgery can relieve the second, and medical measures can prevent or minimize the third.

Acute epidural hematoma occurs with modest trauma to the side of the head and has classic sequence of trauma, unconsciousness, lucid interval (with completely asymptomatic patient who returns to his previous activity), gradual lapsing into coma again, fixed dilated pupil (90% of the time on the side of the hematoma), and contralateral hemiparesis with decerebrate posture. CT scan shows biconvex, lens-shaped hematoma. Emergency craniotomy produces dramatic cure. Because every patient who has been unconscious gets CT scan, the full-blown picture with the fixed pupil and the contralateral hemiparesis is seldom seen.

Acute subdural hematoma has the same sequence, but the trauma is much bigger, the patient is usually much sicker (not fully awake and asymptomatic at any point), and the neurologic damage is severe (because of the initial blow). CT scan will show semilunar, crescent-shaped hematoma. If midline structures are deviated, craniotomy will help, but prognosis is bad. If there is no deviation, therapy is centered on preventing further damage from subsequent increased ICP. Do ICP monitoring, elevate head, hyperventilate, avoid fluid overload, and give mannitol or furosemide. Do not diurese to the point of lowering systemic arterial pressure. (Brain perfusion = arterial pressure — intracranial pressure.) Hyperventilation is recommended when there are signs of herniation, and the goal is a PCO_2 of 35. Sedation and hypothermia have been used to decrease brain activity and oxygen demand. Hypothermia is currently suggested as a better option to reduce oxygen demand. As an interesting aside, we will encounter the topic of increased intracranial pressure again when we review brain tumors. We treat that problem with high-dose steroids, rather than in the way we have just detailed in cases of trauma.

Diffuse axonal injury occurs in more severe trauma. CT scan shows diffuse blurring of the gray-white matter interface and multiple small punctate hemorrhages. Without hematoma there is no role for surgery. Therapy is directed at preventing further damage from increased ICP.

Chronic subdural hematoma occurs in the very old or in severe alcoholics. A shrunken brain is rattled around the head by minor trauma, tearing venous sinuses. Over several days or weeks, mental function deteriorates as hematoma forms. CT scan is diagnostic, and surgical evacuation provides dramatic cure.

Hypovolemic shock cannot happen from intracranial bleeding. There isn't enough space inside the head for the amount of blood loss needed to produce shock. Look for another source.

Neck Trauma

Penetrating trauma to the neck leads to surgical exploration in all cases where there is an expanding hematoma, deteriorating vital signs, or clear signs of esophageal or tracheal injury (coughing or spitting up blood). A strong tradition of surgical exploration for all gunshot wounds of the middle zone of the neck (regardless of symptoms) is giving way to a more selective approach.

More selective approaches in other settings include the following: for gunshot wounds to the **upper zone,** arteriographic diagnosis and