MAYO CLINIC

Clinical Update

Current Trends in the Practice of Medicine

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Management of Acute Aortic Dissection and the International Registry of Acute Dissection

The Challenge

Acute dissection is the most common fatal aortic catastrophe, with the incidence estimated at 10 to 15 per 100,000 adults in the United States annually. While thoracic aortic dissections are uncommon, their malignant course makes them an important cause of cardiovascular morbidity and mortality.

The underlying cause of aortic dissection is medial degeneration. This may be secondary to inherited connective tissue diseases such as Marfan syndrome, Ehlers-Danlos syndrome, or any of a family of thoracic aortic aneurysm and dissection syndromes. More commonly, medial degeneration occurs secondary to long-term complications of hypertension. Tobacco use accelerates the process. Dissections also occur more commonly among patients with aortic dilation, as increasing aortic diameter increases wall tension and the mechanical stress placed on the aortic tissues. Rarely, dissections occur during pregnancy, most often in women with connective tissue disorders. Dissections tend to occur somewhat earlier in men (peak incidence in their 50s to 60s) than in women (peak incidence in their 60s to 70s).

Points to Remember

- Thoracic dissections are classified anatomically as Stanford type A if the ascending aorta is involved and Stanford type B if the dissection is confined to the descending thoracic or thoracoabdominal aorta.
- Type A dissections are treated surgically on an urgent or emergent basis except under unusual circumstances. Treatment of type B dissections is more controversial, particularly in the era of endovascular stent grafts.
- Patients who have experienced aortic dissection should be followed carefully with aggressive control of blood pressure and serial imaging studies.

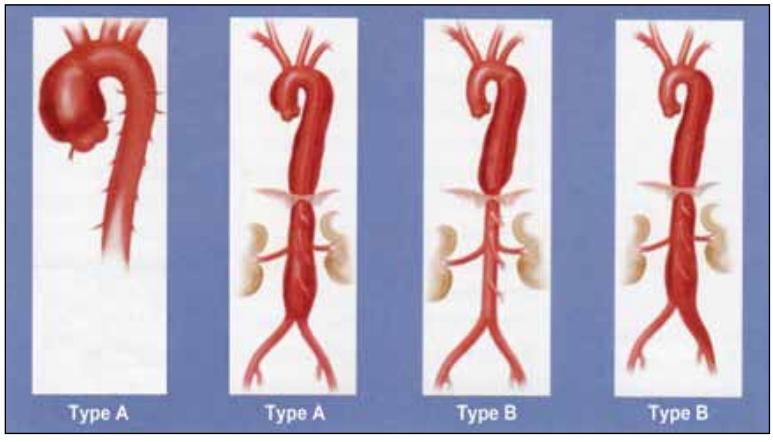


Figure. *Stanford classification of aortic dissection. Both types may extend below the diaphragm.*

Thoracic dissections are classified anatomically as Stanford type A if the ascending aorta is involved and Stanford type B if the dissection is confined to the descending thoracic or thoracoabdominal aorta (Figure). If treated medically, type A dissections may have a mortality rate as high as 80% during the index hospitalization, while the mortality rate for surgical treatment is 10% to 25%. Surgery, on an urgent or emergent basis, is the treatment of choice for type A dissections.

The preferred treatment of type B dissections is more controversial, particularly in the era of

endovascular stent grafts. Historically, the mortality rate associated with medical treatment of type B dissections (approximately 10%) has been clearly less than that for open surgical repair (approximately 30%). Accordingly, the preferred treatment for a patient with type B dissection is aggressive blood pressure control. But when, then, is intervention indicated?

The International Registry of Acute Aortic Dissection (IRAD) has greatly enhanced understanding of the clinical presentation and outcome of acute aortic dissection. The IRAD was established in 1996, and cardiovascular surgeons and cardiologists at Mayo Clinic in Rochester, Minnesota, have been a part of the registry team. The IRAD now includes 24 centers in 12 countries. This group recently published data on the effect of refractory pain and persistent hypertension on outcome and, by inference, their role as indications for surgical intervention in patients with type B dissection.

In their series of 365 patients with acute type B dissection without rupture or malperfusion, 69 had refractory pain or refractory hypertension despite best medical therapy. While the overall in-hospital mortality was 6.5% for all 365 patients with type B dissection, it was dramatically higher among the 69 patients with refractory pain or hypertension (17.4% vs 4% for the remainder). Within this same 69 patients, the mortality rate among those with no intervention (35.6%) was significantly higher than that for those treated surgically (20%) or endovascularly (3.7%). These data support the notion that recurrent pain and refractory hypertension should encourage a more aggressive interventional approach to patients with type B dissection. These data also suggest a role for endovascular stent grafts in this subset of patients. It must be clearly stated, however, that endovascular stent grafts are currently approved by the US Food and Drug Administration only for the treatment of aneurysmal disease, but not dissection.

Among the patients with uncomplicated type B dissection who did not experience refractory pain or hypertension, the mortality rate in medically treated patients was 1.5%. As we consider the use of endovascular stent grafting to prevent late complications in patients with uncomplicated dissection, any intervention, be it surgical or endovascular, must be accomplished without incremental risk increases.

Finally, patients experiencing either type A or type B should be followed carefully with aggressive control of blood pressure and serial imaging studies to observe for aneurysmal dilation of the injured aorta. All too often, these patients do not receive appropriate follow-up after an initial surgical repair or successful nonoperative hospitalization at the time of the acute event. As many as 30% of patients with dissection of the descending thoracic and thoracoabdominal aorta ultimately demonstrate expansion of the aorta sufficient to warrant consideration of surgical intervention.

Surgery for Metastatic and Primary Spinal Column Tumors

Tumors of the bony spinal column may require resection with stabilization of the spinal column to improve patient outcome, reduce the risk of paralysis, and reduce pain. Although the goal in metastatic spinal tumors is often palliative, the goal in some primary bone tumors, such as chordoma of the spinal column, is to effect a cure.

Metastatic Tumor Resection

Occurrence of metastatic spine tumors is becoming increasingly common as the number of cancer survivors grows. It is estimated that vertebral masses develop in approximately 40% of cancer patients, and 10% to 20% have spinal cord compression. Metastatic spinal tumors can cause fractures, pain, and neurologic dysfunction from spinal cord compression. Advances over the past 15 years have improved outcomes in the surgical approaches taken to manage metastatic tumors. Often, surgery is followed by adjuvant radiotherapy. The goal of surgery is to reduce pain and improve function by removing the tumor, decompressing the spinal cord, and stabilizing and reconstructing the spine. The purpose of surgery is to maintain or improve the patient's quality of life.

At Mayo Clinic in Rochester, Minnesota, the criteria for surgical candidacy include the type of tumor and the patient's expected survival time (ie, 3 to 6 months or more) and current functional and overall health status. Occasionally, metastatic tumors are identified before loss of function, but for patients with a sudden onset of weakness or paralysis, the window of opportunity to restore function is

Points to Remember

- Advances over the past 15 years have improved outcomes in the surgical approaches taken to manage metastatic spinal tumors.
- When the onset of weakness or paralysis due to metastatic tumors occurs suddenly, the window of opportunity to restore function is usually less than 24 hours. In such cases, the purpose of surgery is to maintain or improve the patient's quality of life.
- Chordomas are far more rare than metastatic tumors but represent the most common primary malignant tumors of the sacrum and the mobile spine. Removal of the chordoma as an intact whole reduces the risk of recurrence and prolongs patient survival.

very short—usually less than 24 hours. Patients who live at a distance from Mayo Clinic may be flown to Rochester by Mayo's emergency medical helicopter service for immediate evaluation.

Chordoma Resection

Chordomas are slow-growing primary malignant bone tumors that can reach enormous proportions (Figure). Although far more rare than metastatic tumors, chordomas represent the most common primary malignant tumors of the sacrum and the mobile spine. Symptoms are often insidious in onset and their cause remains undiagnosed for months to years, until the tumor is so large that it disrupts function. Depending on their location, chordomas can cause pain and sensory and motor abnormalities, as well as bowel, bladder, or sexual dysfunction, airway obstruction, and swallowing difficulties. They can become large enough to compress vital structures, such as the aorta or vena cava.

Chordomas are encapsulated tumors. If a surgeon tries to debulk or break up the tumor in surgery, the tumor will spread. However, if the entire tumor is removed en bloc as an intact whole, survival can be prolonged. Anything more than a needle biopsy risks recurrence. Thus, it is critical that the tumor be removed as a single mass, even when the tumor is extremely large. In addition to problems stemming from their unusual size, chordomas can metastasize to other organs. Without surgery, chordomas are fatal in approximately 50% to 70% of patients. The procedure is provided at only a few medical centers in the world and typically involves a radical en bloc resection.

Depending on the location of the tumor, such a procedure may involve thoracic, orthopedic, cardiac, general, and plastic surgeons in addition to the neurosurgeon. Surgery may take place over several days, during which the site is prepared, the entire tumor removed in a single encapsulated mass, and the spine reconstructed. Such a procedure requires several days of coordinated efforts among multiple team members and postoperatively the services of a pain management team and rehabilitation specialists.

Resecting a large chordoma as an encapsulated whole can be extremely challenging. However, major en bloc resections of this type can be done with the kind of specialized expertise and interdisciplinary team effort that is characteristic of Mayo Clinic's practice. Although spinal tumor removal may require a major surgical procedure, patient surveys show that patients are pleased with the outcome. For patients with chordoma, surgery can be lifesaving. For appropriately selected patients with metastatic spine tumors, surgery can make a marked difference in quality of life.

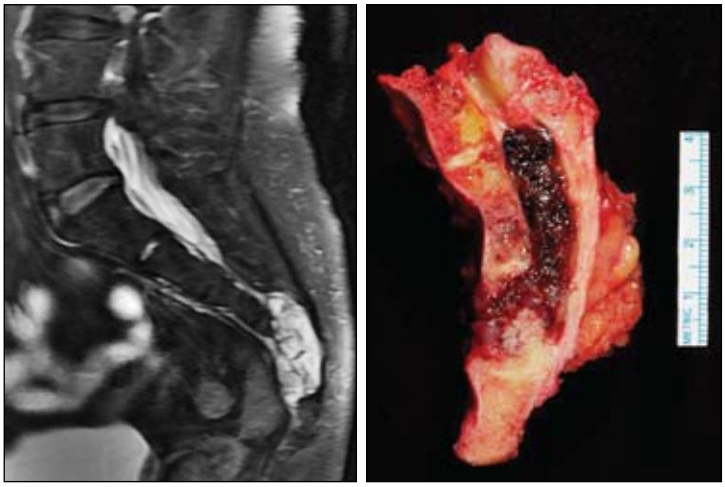


Figure. *MRI scan (left) and postsurgical specimen (right) of a sacral chordoma that was resected en bloc.*

Diagnosis and Surgical Management of Gallbladder Carcinoma

Gallbladder carcinoma (usually adenocarcinoma) currently affects about 5,000 new patients per year in the United States. Gallbladder carcinoma is typically observed as an abnormality on preoperative imaging or very commonly as an incidental finding during cholecystectomy or in subsequent pathologic evaluation of the gallbladder.

Points to Remember

- Gallbladder cancer is one of the most lethal carcinomas and continues to pose many challenges for surgeons.
- Diagnostic laparoscopy is a critical initial procedure to evaluate for metastatic disease.
- Carcinoma in situ and carcinoma involving just the submucosal layers can be observed after simple cholecystectomy. For a tumor that involves the muscular layers, most experts recommend radical cholecystectomy, with removal of the rim of the liver around the gallbladder bed as well as regional lymph nodes.

Diagnosis

Preoperative diagnosis of gallbladder carcinoma is often initially determined via ultrasound, appearing as either a polyp of the gallbladder or asymmetric thickening of the gallbladder wall (Figure 1). When these findings suggest the presence of cancer, the patient should undergo additional abdominal imaging, either magnetic resonance imaging or computed tomography (Figure 2), and a chest x-ray study to detect any other signs of metastatic disease.

In patients with either a radiographic finding suspicious for gallbladder cancer or a previous cholecystectomy showing adenocarcinoma of the gallbladder, diagnostic laparoscopy is a critical step in carefully evaluating for metastatic disease. This tumor has a high propensity for intraperitoneal spread, and the laparoscopist should look closely for peritoneal seeding. Patients who have already undergone laparoscopic cholecystectomy, particularly if the gallbladder was removed without a collection bag through one of the ports, require evaluation for involvement of the port site. This evaluation should be carried out early in the operation, since involvement of 1 trocar site or more often implies peritoneal spread.

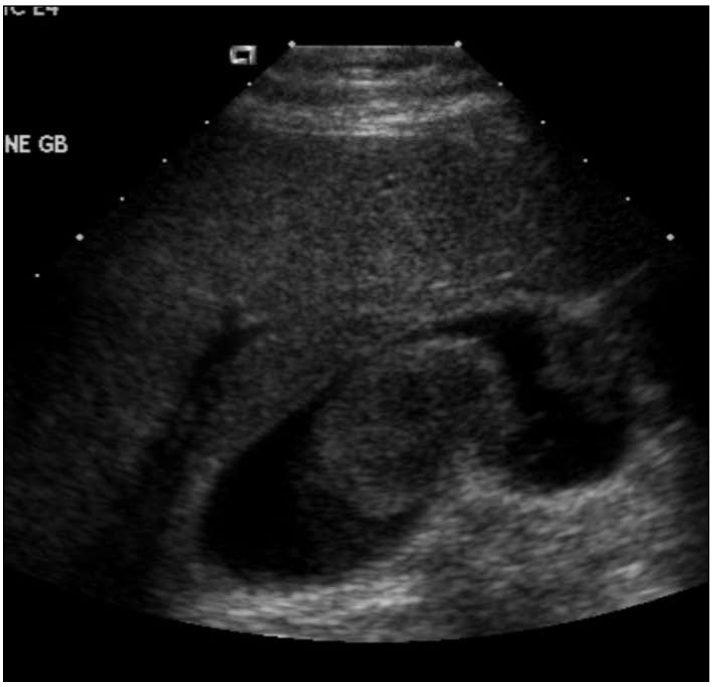


Figure 1. *Ultrasound image shows a polypoid gallbladder cancer.*

Involvement of the liver and distant metastasis in the liver itself are common and should also be evaluated. Anything suggestive of disease spread beyond the gallbladder fossa and regional lymph nodes within the hepatoduodenal ligament is generally considered unresectable disease.

Treatment

When gallbladder carcinoma is diagnosed on the basis of a previous cholecystectomy specimen, the depth of the tumor involvement determines what additional treatment is required. Carcinomas in situ and carcinomas involving just the submucosal layers but not muscle (T1A lesions) can be observed after simple cholecystectomy. If the tumor involves the muscle (T1B cancers), most experts recommend treatment with a radical cholecystectomy, with the removal of 2 to 3 cm of normal liver around the gallbladder bed (segments IVB and V) and the lymph nodes within the hepatoduodenal ligament, behind the head of the pancreas and along the common hepatic artery. Multiple uncontrolled experiences have shown some improvement in patient survival with this

radical approach, when compared to observation after simple cholecystectomy. Any structure adherent to the gallbladder fossa needs to be considered potentially involved by residual cancer and should also be resected en bloc with the liver specimen.

Options for adjuvant therapy remain limited. Radiation therapy with fluorouracil radiosensitization is the most commonly used postoperative treatment. Current trials are investigating the role of capecitabine, gemcitabine, oxaliplatin, and bevacizumab in the management of gallbladder carcinoma.

Carcinoma of the gallbladder is a disease with poor outcomes because it is a very biologically aggressive tumor, often not amenable to curative resection. However, it is important not to rule out curative possibilities for patients with early-stage disease, either found incidentally at cholecystectomy or in patients who have x-ray findings suggestive of gallbladder cancer preoperatively. In these patients, aggressive surgical management offers the best chance for cure. Surgery and treatment undertaken at larger centers like Mayo Clinic, where experienced teams help with perioperative management of the patient as well as adjuvant therapy, have strong track records for yielding positive outcomes.

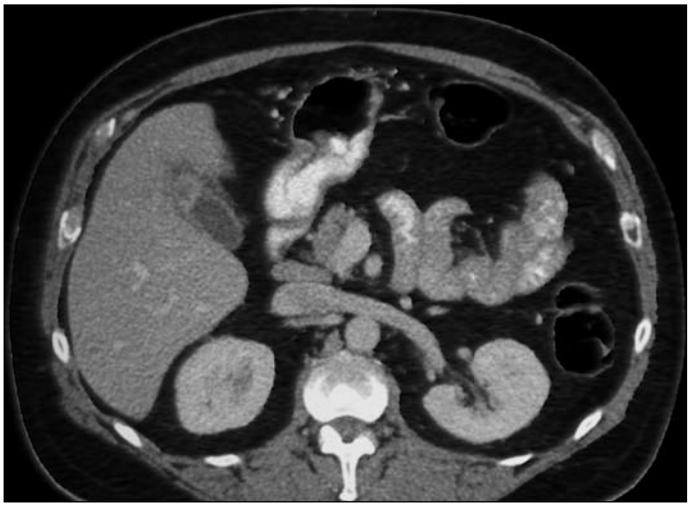


Figure 2. *CT scan shows localized cancer of the gallbladder.*

Robotic Thyroidectomy

Robotic thyroidectomy is a relatively new application of the surgical robot and allows completion of a total thyroidectomy and central compartment node dissection. Although the robotic approach is not minimally invasive and is not the current standard of care, this approach has a cosmetic advantage—no neck scars.

Robotic thyroidectomy was pioneered in Asia. The need to avoid scars in a population with a high incidence of keloid formation and social stigma associated with neck scars provided the impetus for this approach. And this work forms a benchmark for early adopters in the United States and elsewhere.

According to surgeons in the Department of Otorhinolaryngology at Mayo Clinic in Rochester, Minnesota, robotic thyroidectomy is possible because of the excellent visualization provided by a high-resolution camera, wristed instrumentation promoting delicate and complex motions, and application of the harmonic scalpel to divide and seal vessels without ligature.

Although most applications of the surgical robot can be considered minimally invasive, its application to thyroidectomy should not be considered minimally invasive because the incisions are more distant and, therefore, a greater dissection length is required for access. The surgical robot consists of a surgeon workstation (Figure 1) and a separate working platform, with articulated arms in contact with the patient (Figure 2).

Points to Remember

- Robotic thyroidectomy is a relatively new application of the surgical robot and allows completion of a total thyroidectomy with no surgical scar in the patient's neck.
- Ideal surgical candidates have either indeterminate thyroid lesions less than 4 cm in diameter or confirmed papillary thyroid cancers less than 2 cm in diameter that do not extend to the posterior portion of the gland.
- Mayo Clinic surgeons have established a prospective study to determine the safety, applicability, and outcomes associated with robotic thyroid surgery.

Figure 1. *The surgeon workstation of the surgical robot.*

Access for the camera and instruments to reach the thyroid and central neck is acquired by an incision of approximately 6 cm in the anterior axillary fold and a separate small skin incision adjacent to the sternum (Figure 3). Elevation of skin and subcutaneous tissues off the pectoralis fascia and lower neck muscles provides working space. The camera and 2 working arms are placed through the anterior axillary fold incision and a separate working arm is placed through the separate skin incision adjacent to the sternum. The 30° camera angle and harmonic scalpel allow the surgeon to perform a near-total thyroidectomy and central compartment node dissection if indicated.

Ideal surgical candidates have indeterminate thyroid lesions less than 4 cm in diameter or confirmed papillary thyroid cancers less than 2 cm in diameter that do not extend to the posterior portion of the gland. Patient body habitus must be taken into consideration, and obese patients are not candidates.

Current contraindications to the robotic approach include thyroid cancer spread to lateral neck nodes, papillary cancers larger than 2 cm in diameter or located in the posterior portion of the gland, and indeterminate lesions greater than 4 cm in diameter. As with most procedures, gradual expansion of indications will occur as experience builds.

Open-collar incision, which in experienced hands is very safe, effective, and well accepted for access to the thyroid gland, is the standard with which we need to compare outcomes. Until we learn more, robotic thyroidectomy should be reserved for patients who, for cosmetic reasons, wish to avoid a neck scar in exchange for an inci-

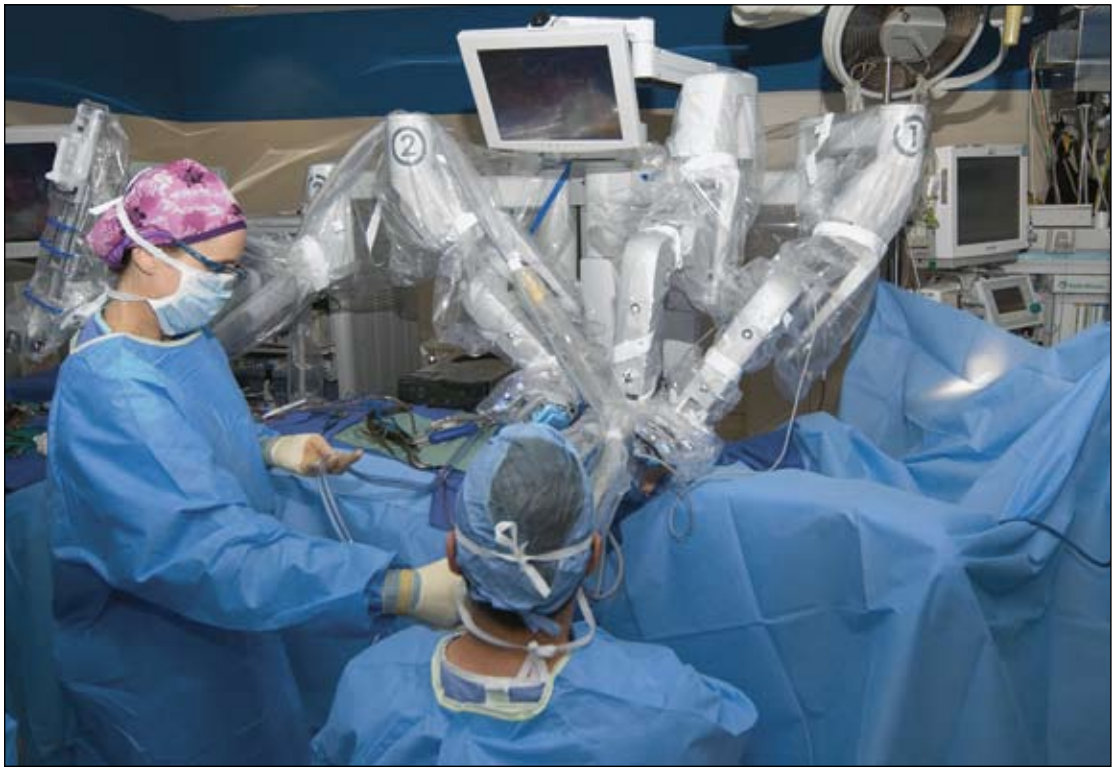


Figure 2. *The surgical robot working platform with articulated arms that are in contact with the patient.*

sion and scar in the anterior axillary fold.

To determine the safety, applicability, and outcomes associated with robotic thyroid surgery, Mayo Clinic surgeons have established a prospective study. Early experience with partial and near-total thyroidectomy has been rewarding without complications of permanent hypocalcemia or vocal cord paralysis.

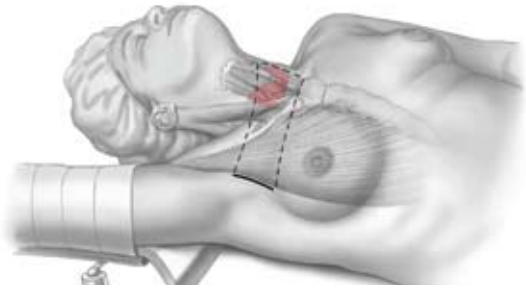
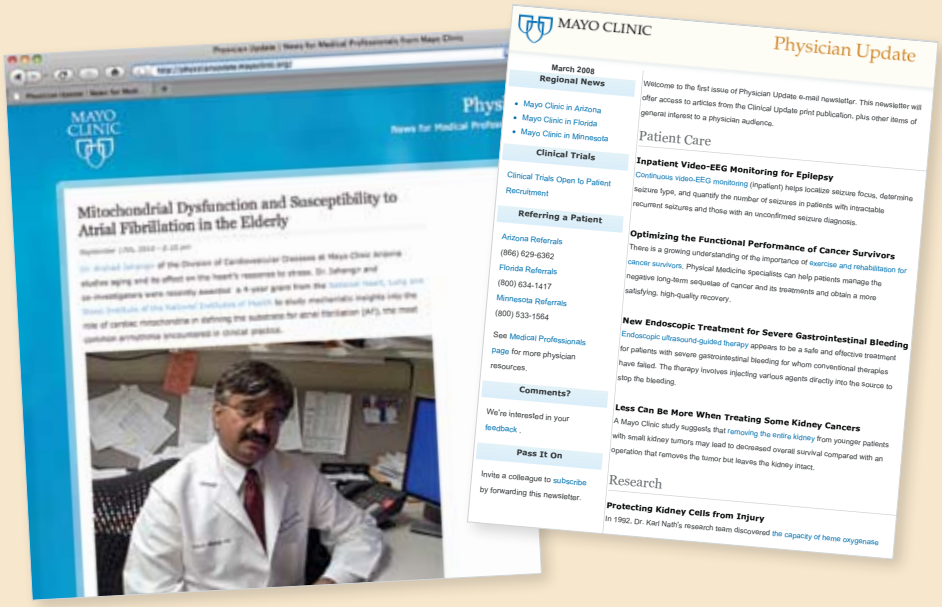


Figure 3. *Drawing showing patient position and the anterior axillary line incision.*

Physician Update



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Education Opportunities

Mayo Clinical Reviews and Primary Care Update
June 6-10, 2011, Amelia Island, FL
This clinical review and primary care update consists of lectures, discussions, and workshops on challenges of general interest in various areas of medicine, surgery, and pediatrics. Medical staff from Mayo Clinic and Nemours Children's Clinic (Jacksonville, FL) provide reviews and updates in the areas of cardiology, dermatology, endocrinology, gastroenterology, infectious diseases, internal medicine, neurology, women's health, pediatrics, pulmonology, and sports medicine.

To register or for more information, call 800-462-9633 or e-mail cme-jax@mayo.edu.

Hot Topics in Neurology and Neurosurgery for the Primary Clinician
June 9-10, 2011, Rochester, MN
This course provides education on the newer interventional therapies available for various neurologic and neurosurgical conditions that have evolved over the past 10 years, including the latest in deep brain stimulation and endovascular interventions for cerebrovascular disease.

For more information, join the Mayo Clinic Neurology and Neurosurgery Continuing Medical Education Facebook group. Search for *Mayo Clinic Neurology and Neurosurgery Continuing Medical Education (CME).* Through this group, access CME updates, short videos from interviews with numerous speakers and course directors, and a forum for networking opportunities.

To register or for more information, call 800-323-2688 or e-mail cme@mayo.edu.

Controversies in Women's Health
July 14-16, 2011, Wisconsin Dells, WI
This course informs health care providers on controversial topics related to the care of women patients. Presentations, panel discussions, and hands-on workshops feature experts from a variety of specialties, including obstetrics and gynecology, cardiology, oncology, endocrinology, general internal medicine, and psychiatry. Ample time to discuss cases from your clinical practice is provided. Electronic course syllabus included with registration (flash drive).

To register or for more information, call 800-323-2688 or e-mail cme@mayo.edu.

20th Annual Internal Medicine Board Review—Certification and Maintenance of Certification
July 14-19, 2011, Rochester, MN

This intensive course is designed to help candidates apply the "finishing touches" to their preparations for the 2011 American Board of Internal Medicine Certification and Maintenance of Certification Examinations. The course also provides practicing physicians with a comprehensive overview of all areas of internal medicine.

To register or for more information, call 800-323-2688 or e-mail cme@mayo.edu.

2011 Primary Care Update: A Four Corners Experience
July 29-30, 2011, Durango, CO

This course provides primary care physicians, medical specialists, and allied health professionals with the latest information on diagnosis and therapy related to selected topics in medicine and surgery.

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