Chapter 34
ABDOMINAL WALL HERNIAS

Hernias of the abdominal wall are among the most common conditions requiring operation. Despite the frequency of surgical repair, the rate of recurrence is high. The outcome of hernia surgery is highly surgeon-dependent.

Definitions A *hernia* is a protrusion of a viscus through an opening in the wall of the cavity in which it is contained. The important features of a hernia are the hernial orifice and the hernial sac. The *hernial orifice* is the defect in the innermost aponeurotic layer of the abdomen, and the *hernial sac* is the outpouch of peritoneum. The neck of a hernial sac corresponds to the orifice. The hernia is *external* if the sac protrudes completely through the abdominal wall and *internal* if the sac is within the visceral cavity. A hernia is *reducible* when the protruded viscus can be returned to the abdomen and *irreducible* when it cannot. A *strangulated hernia* is one in which the vascularity of the protruded viscus is compromised. Strangulation occurs in hernias that have small orifices and large sacs. An *incarcerated hernia* is an irreducible hernia but not necessarily strangulated. A *Richter's hernia* is a hernia in which the contents of the sac consist of only one side of the wall of the intestine (always antimesenteric).

Sites of Herniation The common sites of herniation are the groin, umbilicus, linea alba, semilunar line of Spieghel, diaphragm, and surgical incisions. Other similar but very rare sites of herniation are the perineum, superior lumbar triangle of Grynfelt, inferior lumbar triangle of Petit, and the obturator and sciatic foramina of the pelvis.

Clinical Manifestations The natural history of hernias is a slow enlargement to the point of irreducibility and disfigurement, with the risk of strangulation. The discomforts produced by hernias are always worse at the end of the day and are relieved at night when the patient reclines and the hernia reduces. Groin pain without a demonstrable hernia usually does not indicate the onset of a hernia.

Most hernias develop insidiously, but some are precipitated by a single forceful muscular event. Typically, a hernial sac with its contents enlarges and transmits a palpable impulse when the patient strains or coughs. Usually, the patient must stand during the examination because it is impossible to palpate a reduced groin hernia when the patient is supine. Hydroceles transilluminate, but hernias do not. Hernias undetectable by physical examination can be demonstrated by using ultrasound or computed tomography (CT). Strangulation produces intense pain in the hernia, followed quickly by tenderness, intestinal obstruction, and signs or symptoms of sepsis. Reduction of a strangulated hernia is contraindicated if there is sepsis or the contents of the sac are thought to be gangrenous.

Indications for Surgery All hernias should be repaired unless local or systemic conditions of the patient preclude a safe outcome. The possible exception is a hernia with a wide neck and shallow sac that is anticipated to enlarge slowly. Trusses are helpful in the management of small hernias when operation is contraindicated. Trusses are

contraindicated for patients with femoral hernias.

HERNIAS OF THE GROIN

The groin is one of the naturally weak areas in the abdominal wall and is the most common site for herniation. Males are 25 times more likely to have a groin hernia. Hernias arising above the abdominocrural crease are inguinal, and those arising below the crease are femoral. Inguinal hernias can be direct or indirect. The sac of an indirect inguinal hernia passes obliquely or indirectly toward and ultimately into the scrotum. The sac of a direct inguinal hernia protrudes directly outward and forward. Clinically distinguishing an indirect from a direct inguinal hernia often is impossible and is of little importance because the operation to repair them is the same. In males, indirect hernias outnumber direct hernias 2:1, whereas in females, direct hernias are a rarity. Femoral hernias occur occasionally in females but not as frequently as inguinal hernias; in males they are rare. Femoral hernias almost always appear as an irreducible mass at the medial base of Scarpa's femoral triangle. A femoral hernia can appear irreducible even though the sac may be empty because fat and lymph nodes surround the sac. A solitary enlarged lymph node can mimic a femoral hernia exactly.

Epidemiology Hernias are a common health problem; the accepted incidence is 3–4 percent. Strangulation occurs in 1.3–3.0 percent of groin hernias. Most strangulated hernias are indirect inguinal hernias,

but femoral hernias have the highest rate of strangulation. The probability of strangulation is greatest in the first 3 months.

Anatomy An indirect hernial sac is a dilated persistent processus vaginalis. It passes though the deep inguinal ring and follows the cord to the scrotum. At the deep ring, the sac occupies the anterolateral side of the cord. Properitoneal fat often is associated with the indirect sac and is known as a *lipoma of the cord,* although the fat is not a tumor.

Retroperitoneal organs such as the sigmoid colon, cecum, and ureters may slide into an indirect sac. They thereby become a part of the wall of the sac. Sliding hernias are often large and partially irreducible.

Direct inguinal hernial sacs originate through the floor of the inguinal canal (Hesselbach's triangle), protrude directly, and are contained by the aponeurosis of the external oblique muscle. Rarely, they enlarge enough to force their way through the superficial ring and descend into the scrotum. The bladder is common as a sliding component of a direct hernial sac.

Femoral hernial sacs originate from the femoral canal through a defect in the medial side of the femoral sheath. The femoral canal contains one or two lymph nodes, the largest of which is named *Cloquet.* These nodes are expelled from the femoral canal by a peritoneal protrusion and frequently create a palpable mass.

The passage of the testicle through the abdominal wall during the embryonic stage weakens and enlarges the myopectineal orifice above the inguinal ligament, predisposing males to indirect and direct inguinal hernias. In females, the increased diameter of the true

pelvis proportionally widens the femoral canal and probably predisposes females to femoral herniation.

Etiology Inguinal hernias can be congenital or acquired. All indirect inguinal hernias are congenital and result from a patent processus vaginalis, with which the patient is born. A patent processus vaginalis is found in 80 percent of newborns and in 50 percent of 1-year-olds. The incidence of a patent processus vaginalis in adults is 20 percent. Having the potential for a hernia does not mean a hernia will develop. Other factors must be present to cause failure of the transversalis fascia to retain the visceral sac in the myopectineal orifice. These factors include (1) the erect stance of human beings, (2) muscle deficiency, and (3) destruction of connective tissue from smoking, aging, or systemic illnesses.

Inguinal hernias of all types occur equally in sedentary and physically active individuals. Vigorous physical activity per se is not a cause of inguinal herniation.

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Basics of Groin Hernia Repair The object of groin hernioplasty is to prevent peritoneal protrusion through the myopectineal orifice. Integrity is restored in two fundamentally different ways: (1) aponeurotic closure of the myopectineal orifice to the extent necessary and (2) replacement of the defective transversalis fascia with a large synthetic prosthesis. The two methods occasionally are combined.

Hernias are repaired anteriorly through a groin incision or posteriorly through an abdominal incision. The anterior approach is the most popular incision for inguinal hernioplasty. Posterior hernia repairs are called *properitoneal hernioplasties*.

Tension is the principal cause of failure of all hernioplasties that close the myopectineal orifice by aponeurotic approximation. Assiduous efforts to prevent suture-line tension are essential. Permanent monofilament synthetic sutures are preferable.

Synthetic mesh prostheses have a major role in the management of hernias of the groin. Mesh prostheses are used to patch or plug the myopectineal orifice, to reinforce a classic repair, and to replace the transversalis fascia.

Anterior Classic Groin Hernioplasty Three anterior classic hernioplasties are used: the Marcy simple ring closure, the Bassini operation, and the McVay-Lotheissen Cooper ligament repair. All produce equally satisfactory results in primary hernias when correctly indicated and are easily performed with local anesthesia in adults. Recurrent inguinal hernias are fixed by prosthetic techniques because the results are distinctly better. Classic hernioplasty has three parts: dissection of the inguinal canal, repair of the myopectineal orifice, and closure of the inguinal canal.

The Marcy repair of the myopectineal orifice consists of tightening an enlarged deep ring only. It is commonly called *simple ring closure* and is indicated in males and females with only minimal damage to the deep ring. The operation restores the anatomy of the deep ring by placing one or two sutures in the transverse aponeurotic arch and the iliopubic tract just medial to the spermatic cord or the round ligament.

The Bassini-Shouldice hernioplasty repairs the myopectineal orifice superior to the inguinal ligament, i.e., the deep ring and Hesselbach's triangle, and is indicated in all direct and

indirect inguinal hernias. The Bassini repair consists of high ligation of the sac and approximation of the conjoined tendon and the internal oblique abdominal muscle to the shelving edge of the inguinal ligament. The McVay-Lotheissen Cooper ligament hernioplasty repairs the three areas most vulnerable to herniation in the myopectineal orifice, i.e., the deep ring, Hesselbach's triangle, and the

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femoral canal. In the McVay-Lotheissen repair the transverse aponeurotic arch is sutured to Cooper's ligament medially and to the femoral sheath laterally. Relaxing incisions are mandatory because otherwise there is too much tension on the suture line.

Femoral hernias with small orifices in females only are repaired from below the inguinal ligament with a few sutures or corked with a cylindrical plug of Marlex because they rarely are associated with hernias above the inguinal ligament. Large femoral hernias in females and all femoral hernias in males are repaired by the McVay-Lotheissen Cooper ligament repair or by a properitoneal prothesis. Strangulated femoral hernias are preferably accessed properitoneally because this provides direct access to the constricting femoral hernial orifice, easy release of the entrapped bowel by incision of the iliopubic tract and lacunar ligament, and ample room for bowel resection. Strangulated inguinal hernias are managed easily through a groin incision.

In indirect hernias in infants, children, and some young males, the myopectineal orifice and transversalis are not damaged, and classic repair is unnecessary; merely eliminating the sac cures the hernia.

In young males, exploration of the contralateral groin commonly is performed up to age 3 years, especially if a unilateral hernia is present on the left. This avoids a second hernioplasty later.

Prosthetic Material for Hernioplasty Synthetic mesh prostheses for hernia repair include Marlex, Prolene, Trelex, Surgipro, Mersilene, and Gore-Tex. Marlex, Trelex, and Prolene mesh are composed of knitted monofilament fibers of polypropylene and resemble each other. All are porous, slightly elastic, semirigid, and contain plastic memory. Surgipro mesh is composed of knitted braided strands of polypropylene. Its physical characteristics closely resemble knitted meshes of monofilament polypropylene. Mersilene is an open-knitted mesh composed of braided fibers of the polyester Dacron. It is porous, soft, supple, elastic, and without plastic memory and has a grainy texture to prevent slippage.

Tension-Free Hernioplasties Prosthetic soft tissue patches have been used to reinforce classic repairs but without significantly improving results. When the prosthesis is implanted without a formal repair, obviating tension, results improve dramatically. Lichtenstein developed a tension-free repair for femoral and recurrent inguinal hernias when the defect is fibrous, circumscribed, and not too large. The technique consists of a prosthetic plug that stoppers the aponeurotic defect. Tension-free hernioplasties may not be appropriate for repair of most recurrent groin hernias in

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males because they require redissection of the spermatic cord, a paramount cause of testicular atrophy. Tension-free hernioplasties are easy to perform, even with local anesthesia; recovery is quick; and results are superb. Tension-free hernioplasties are

suited to the management of simple primary hernias in males but are not the procedures of choice for complex groin hernias or those with complications.

Properitoneal Groin Hernioplasty The properitoneal space is the logical site to implant a prosthesis. The prosthesis is held in place by intraabdominal pressure and is relatively immune to superficial infection. The hernia defect can be patched or plugged and hernioplasties buttressed with a prosthesis from the posterior approach just as they can be from the interior. The properitoneal prosthetic technique to eliminate hernias of the groin with a large nonresorbable prosthesis that functionally replaces the transversalis fascia was introduced by Stoppa. The prosthesis adheres to the visceral sac and renders the peritoneum inextensible so that the peritoneum cannot protrude through the myopectineal orifice or adjacent areas of weakness; repair of the defect in the abdominal wall is unnecessary. The operation is technically known as *giant prosthetic reinforcement of the visceral sac* (GPRVS) but is commonly called the *Stoppa procedure.* GPRVS is an efficient, anatomic, and tension-free repair. When done correctly, it cures all hernias of the groin with rapid recovery and minimal discomfort.

Laparoscopic Repair There is no question that laparoscopic hernioplasty can be done successfully in experienced hands and that in some patients produces less postoperative pain. It is inherently riskier than open hernioplasty. Data from the most experienced laparoscopic hernia surgeons have been compared with those of surgeons who have specialized in open hernioplasty. The results showed that with the exception of wound infection, the morbidity, mortality, and recurrence rates after laparoscopic hernioplasty are significantly higher than those after open hernioplasty. The degree of postoperative discomfort should never be the motivating factor in selecting the type of operation. Open hernioplasty, preferably tension-free, with local anesthesia, when possible, is the procedure of choice for most patients.

Complications Ischemic orchitis, with its sequela of testicular atrophy, and residual neuralgia are two important but uncommon complications unique to groin hernioplasty. They occur more frequently after anterior groin hernioplasty because the nerves and

spermatic cord are necessarily dissected and mobilized. Recurrences also are rightfully a complication of groin hernioplasty.

Classic repairs obtain recurrence rates in the range of 1–3 percent in a 10-year follow-up. Recurrences are caused by excessive tension on the repair, deficient tissues, inadequate hernioplasty, and overlooked hernias. Recurrences, predictably, are more common in patients with direct hernias, especially bilateral direct inguinal hernias. Indirect recurrences result from insufficient excision of the proximal end of the sac, insufficient repair of the deep ring, and continued atrophy of the shutter mechanism. Most recurrences are direct and usually are in the region of the pubic tubercle, where suture-line tension is the greatest. Repairing bilateral inguinal hernias simultaneously does not increase suture-line tension and is not a cause of recurrence. Recurrent hernias require a prosthesis for successful repair. Recurrences after anterior prosthetic hernioplasty are managed properitoneally with a second prosthesis or anteriorly with a prosthetic plug.

UMBILICAL HERNIA

The umbilicus is a common site of herniation. Umbilical hernias occur more frequently in females. Obesity and repeated pregnancies are common precursors. Strangulation of the colon and omentum is common. Umbilical hernias are common in infants and close spontaneously without special treatment if the aponeurotic defect is 1.5 cm or less. Repair is indicated in infants with hernial defects greater than 2.0 cm in diameter and in all children with umbilical hernia still present by the age of 3 or 4.

Umbilical hernias with a small parietal defect are merely closed by polypropylene suture, and those with large parietal defects are managed with a prosthesis.

EPIGASTRIC HERNIA

Epigastric hernia is a protrusion of properitoneal fat and peritoneum through the decussating fibers of the rectus sheath in the midline (linea alba) between the xiphoid and the umbilicus. Epigastric hernias often are irreducible, invariably have small aponeurotic defects, sometimes are multiple, and often produce discomfort out of proportion to their size. Repair is similar to that of umbilical hernias.

SPIGELIAN HERNIA

Spigelian hernias are ventral hernias occurring along the subumbilical portion of Spieghel's semilunar line and through Spieghel's fascia. Spigelian hernias are rare and, unless large, are difficult to diagnose because they are interparietal and contained by the aponeurosis of the external oblique muscle. Ultrasound and CT scans often reveal symptomatic spigelian hernias too small to detect clinically. Spigelian hernias are most common in the area between the umbilicus and the line connecting the anterosuperior iliac spines and in the area beneath the arcuate line and above the inferior epigastric vessels. Small spigelian hernias are simply closed, but large spigelian hernias that are in the muscles require a prosthesis.

PARASTOMAL HERNIA

Parastomal hernias interfere with colostomy irrigations and the adhesion of stomal appliances. Paracolostomy hernias are more common than paraileostomy hernias, and both are more likely to occur when the stoma emerges through the semilunar line rather than the rectus sheath. Parastomal hernias usually are lateral to the ostomy. Moving the stoma to a new location is preferred to local repair. Local repair often fails because the belt muscles lateral to the ostomy lack sufficient aponeurosis. Among the prosthetic repairs, the preferred technique consists of closing the parietal defect lateral to the stoma and implanting a large piece of Mersilene slit to accommodate the stoma.

INCISIONAL HERNIAS

Incisional hernias are serious surgical problems. Obesity and infection are the two principal causes of this condition. The weight of the panniculus pulls apart the surgical incision, and

infection hampers wound healing. A large incisional hernia produces paradoxical respiratory abdominal motion similar to a flail chest. Diaphragmatic function becomes inefficient. The diaphragm no longer contracts against the abdominal viscera and instead forces them into the hernia sac. Appraisal of respiratory function and blood gases is essential. The viscera lose their right of domain in the abdomen in long-standing large incisional hernias. In this instance the reduction of the viscera at operation can cause death by compression of the inferior vena cava and by respiratory failure from forced elevation and immobilization of the diaphragm.

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Progressive pneumoperitoneum is a useful technique to prepare patients for incisional hernioplasty because it overcomes some of the disorders of eventration disease. Pneumoperitoneum stretches the abdominal wall and intraabdominal adhesions, facilitates return of the viscera to the abdomen, and improves diaphragmatic function. Most small incisional hernias are managed by simple closure of the aponeurotic defect. Large incisional hernias with aponeurotic defects greater than 10 cm have recurrence rates as high as 50 percent. Consequently, most incisional hernias and all recurrent incisional hernias require a prosthesis for a successful repair. The Stoppa hernioplasty is preferred; it is applicable to all types of abdominal incisional hernias, including postnephrectomy lumbar hernias.

In the Stoppa hernioplasty, a very large Mersilene prosthesis is implanted deep to the muscles of the abdominal wall on top of the posterior rectus sheath or peritoneum. The prosthesis extends far beyond the borders of the myoaponeurotic defects and is firmly held in place by intraabdominal pressure and later by fibrous ingrowth. The prosthesis prevents peritoneal eventration by rendering the visceral sac indistensible and by solidly uniting and consolidating the abdominal wall.

Aponeurotic closure of the parietal defect is important. The midline closure can withstand greater tension because the prosthesis, not the suture line, ultimately unites the abdomen. When necessary, tension can be reduced by vertical relaxing incisions in the rectus sheath. Aponeurotic approximation is usually achievable, but when it is not, a second absorbable or nonabsorbable prosthesis inlaid in the aponeurotic defect will ensure stability of the abdominal wall during the healing process. Dead space created by large prostheses always requires closed-suction drainage to prevent seromas and hematomas and to allow quick fibrous incorporation of the prosthesis in the abdominal wall.

Infection Infection is a serious complication and occurs in as many as 10 percent of patients. Early infection is managed by prompt and complete exposure of the prosthesis. With intense local and systemic antimicrobial therapy, complete integration of the prosthesis can be anticipated. When delayed infections occur, reintegration of the infected prosthesis usually does not occur, and removal of the sequestered portion of the prosthesis becomes necessary. In these patients, removal of the integrated remaining prosthesis is unnecessary.

For a more detailed discussion, see Wantz GE: Abdominal Wall Hernias, chap. 34 in *Principles of Surgery,* 7th ed.

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