

U
S
S

C A R O L I N A S
**Hernia
Handbook**

B. Todd Heniford, MD

Hernia

C A R O L I N A S
**Hernia
Handbook**

B. Todd Heniford, MD

CHAPTER 1
Inguinal and Femoral Hernias

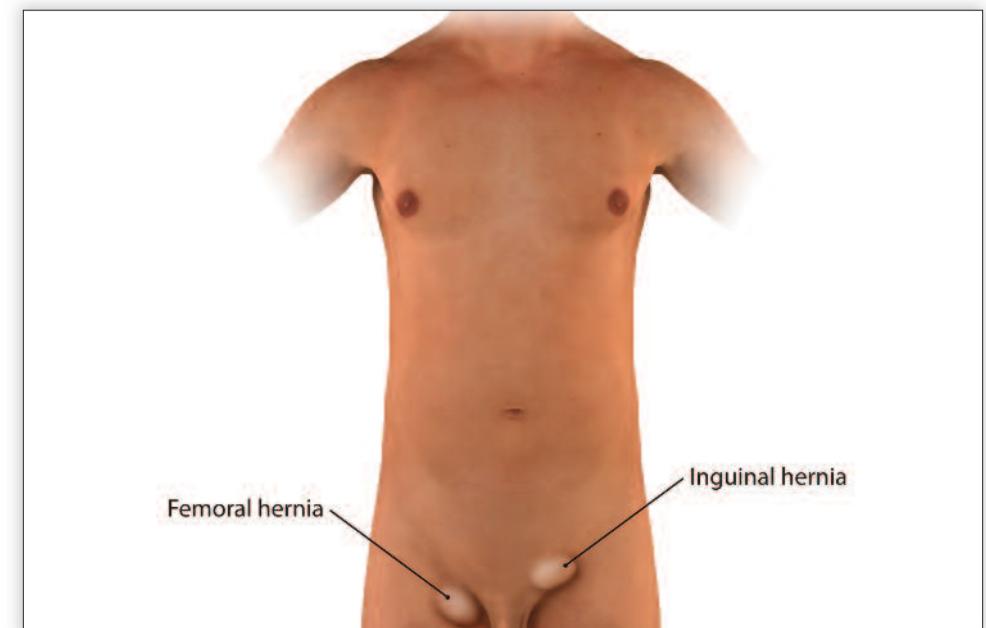
Inguinal and Femoral Hernias

Overview

THE CONDITION

An inguinal or femoral hernia is an area of muscular weakness or a “hole” in the lower abdomen or groin through which a person’s intestines can protrude. These hernias are very common, can cause symptoms of discomfort or other issues, or be perceived as a bulge. Frequently, an inguinal or femoral hernia will go unnoticed until it is discovered by a physician during an examination. Inguinal and femoral hernias are the two hernias that most often occur in the groin (Figure 1).

Figure 1. Groin Hernia Locations



TREATMENT

Surgery

Surgery is the only definitive treatment for groin hernias. Most commonly the area of weakness is covered with a knitted, soft, plastic-like material called mesh. This can be performed in an “open” fashion, where a small (2 - 3 inch) incision is made over the groin area. This can also be completed *laparoscopically*, in which case there will be three small (1/4 to 1/2 inch each) incisions over the lower abdomen.

Observation

Not every hernia needs to be repaired. A hernia that is not bothersome can be watched if the patient wishes. The key reasons to repair a hernia in an adult are that they do not heal or repair themselves, they tend to get larger with time, they often become painful or develop other problems, and if, indeed, tissue or intestine are pushing through the hernia, the intestine can become trapped and require an emergency operation. All of these considerations, especially the latter one, should be assessed by and discussed with your doctor or surgeon (*see full text*).

BENEFITS AND RISKS

Benefits – Surgical repair is the only way to fix a hernia. It may help with discomfort and will fix the bulging in the groin.

Risks – Every operation carries risks and the potential for complications. In the case of groin hernias, these include recurrence, infections, bleeding, urinary retention, reactions to medications, exacerbation of medical conditions, and, very rarely, injury to the testicles or intestines. The possibility of chronic discomfort (lasting > 3 months after surgery) also exists and most commonly occurs in patients who present with pain before surgery. However, the largest proportion of patients that have discomfort are cured of it with surgery.

PREPARATION FOR SURGERY

Depending on the age and health, you may need to have blood drawn, have an EKG, chest X-ray, or other tests. You may need to be seen by a cardiologist to get approved for surgery if you have significant heart problems. You will see a surgeon and an anesthesiologist who will discuss your health history with you.

THE DAY OF THE OPERATION

You should not eat or drink anything at least 6 hours prior to the procedure (usually no food or drink overnight for morning surgeries). If you take medications, you must discuss them with your doctor. If you are instructed to take them, you may take them with a sip of water. If your hernia and a repair are uncomplicated, you may expect to go home the same day, but you must have somebody else drive you.

RECOVERY

You will be advised to limit heavy lifting or strenuous physical activity for 2-6 weeks after the procedure. If your job does not involve strenuous physical activity, you may expect to return to work within several days. After 6 weeks, you should be able to perform at your normal activity level.

Inguinal and Femoral Hernias

WHAT IS A GROIN HERNIA?

A hernia is an area of muscular weakness in the abdomen or groin through which organs, typically intestine, can protrude. When the intestines begin to pass through the area of weakness, the connective tissue that makes up the thin lining of the abdomen stretches to allow the intestines to extend further and further as the hernia increases in size. This lining is known as a “hernia sac” because the intestines sit in the connective tissue like it was a burlap sack.

Inguinal and femoral hernias are two hernias that occur in the groin (Figure 1). Inguinal hernias account for 96% of all groin hernias, while femoral hernias make up the other 4%.¹ Inguinal hernias are more common in men (male-to-female ratio: ratio 9:1), while femoral hernias are most common in women (female-to-male ratio: 4:1).²

The area of weakness that causes inguinal hernias can be present at birth. These often happen in children and young adults and become evident when intestines or other organs pass through the weakness and create a bulge. In other situations, the area of weakness can develop with time. The lifetime risk of developing a groin hernia is

around 25% for males and 3% for females. The term “sports hernia” refers to groin pain associated with athletic activities and is not a true hernia; however, medically directed care or surgery may be needed after a thorough work-up by a physician.

Anatomy

There are two main types of inguinal hernias; they are called “direct” and “indirect”. Indirect hernias are the more common type in men and women. For indirect hernias, the hernia sac protrudes through the internal inguinal ring (Figure 2); a space through which the testicular vessels travel in men and a ovarian/uterine supportive ligament passes for women. In males, the combination of the vessels to the testicles and the vas deferens make up the “spermatic cord”. As a man develops as fetus in the womb, there is a canal that connects the abdomen to the scrotum which begins at the internal ring. Sometimes, this canal does not close fully during pre-natal development. When this happens, organs that are normally inside the abdomen can later protrude through this canal and form a hernia. These hernias can develop in almost anyone at nearly any age. They tend to be perhaps more prone to occur when there is increased pressure in the abdomen, such as when patients frequently strain in the bathroom or gain extra weight. They can also develop as patients get older and lose abdominal muscle tone.

Direct hernias come directly through the abdominal wall and occur within an area known as “Hesselbach’s triangle” (Figure 2). They form due to the weakness of the abdominal wall musculature, and often occur in older males. However, they can occur in younger men and patients may be genetically predisposed to these types of hernias. Increased pressure in the abdomen also contributes to direct hernias.

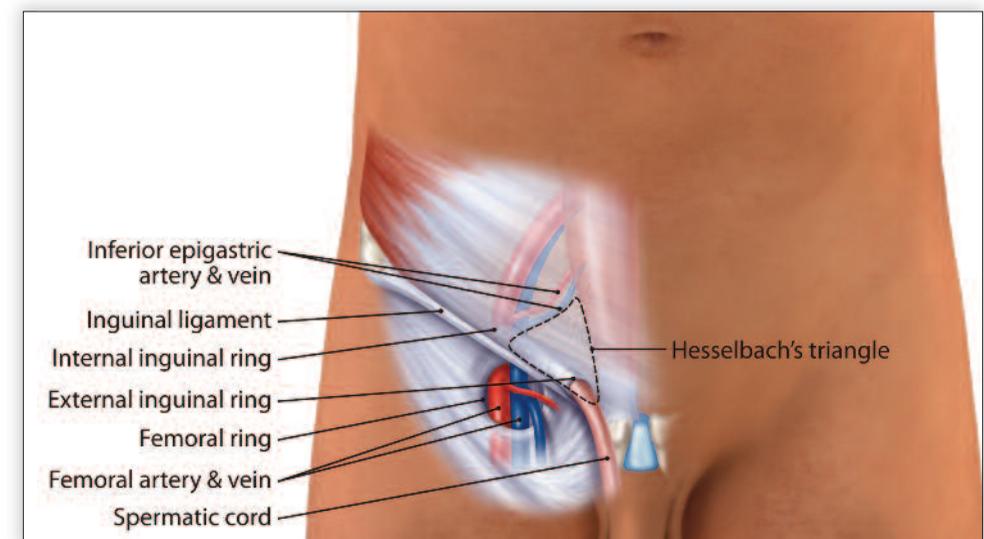
Usually inguinal hernias can be pushed back into the abdomen (this is called “reducing the hernia”), although they later slip back out. “Incarceration” is when intestines get trapped in the hernia and cannot be pushed back into the abdomen through the defect or hole in the abdominal wall. This can lead to blockage of the intestines (“bowel obstruction”). “Strangulation” refers to incarcerated intestines that lose their blood supply due to compression of the blood vessels in the hernia, or where the blood vessels pass through the abdominal wall. While some hernias can be chronically incarcerated and the patients can live normally, strangulation of a hernia contents is a life-threatening problem and requires immediate surgical attention. The strangulated portion of the intestines may die and make the patient extremely sick or challenge their life.

Femoral hernias pass through the femoral canal (Figure 2), which is surrounded by ligaments and a large vein. Femoral hernias are much less common than inguinal hernias, they are difficult to detect, and they are more frequently without symptoms until incarceration or strangulation occurs. Some believe that femoral hernias may carry more risk than inguinal hernias and should be repaired in all patients.

HOW DO I KNOW IF I HAVE A GROIN HERNIA?

Groin hernias can be completely without symptoms and may only be discovered by a physician during a physical exam. When a patient discovers an inguinal hernia, it most often appears as a distinct bulge or lump in the groin or going down to the scrotum. These hernias can also create a sensation of heaviness, pulling, vague discomfort, and the visible bulge in the groin or scrotum that is painful or painless. If a hernia contains incarcerated bowel, patients may complain of pain, nausea or vomiting, abdominal bloating, and pain. If bowel becomes strangulated, severe abdominal pain will develop, and this condition needs to be treated by a surgeon emergently.

Figure 2. Anatomy of the Groin



WHAT ARE THE TREATMENT OPTIONS?

Surgery is the only way to fix hernias, but not all hernias need to be treated. An inguinal hernia that does not cause any major symptoms can be observed. The risk of incarceration and strangulation with inguinal hernias that are observed is suspected to be less than 1% per year³, but in this study many patients whose hernias became symptomatic were no longer observed and underwent surgery. Incarcerated hernias causing bowel obstruction and strangulated hernias should be addressed surgically on an emergent basis. Femoral hernias, in general, should be repaired when found because of high risk of incarceration, which is up to 40%.⁴

Each hernia and its treatment should be individualized according to its location, the tissue protruding through it, the age and medical status of the patient, if the hernia is causing symptoms like pain, limitations in work or play, or intestinal issues, and a physician's assessment of the hernia's risk to the patient and the risk of repairing it. The key reasons to repair a hernia in an adult are that they do not heal or repair themselves, they tend to get larger with time, they often become painful or develop other problems, and if, indeed, tissue or organs are pushing through the hernia, these organs can become trapped and require an emergency operation. Indeed, as hernias increase in size, they can become more difficult to repair, lead to a greater chance of complications, and may yield a higher chance of recurrence of the hernia after repair. As well, patients who wait to develop symptoms or until their symptoms become worse have a greater chance of chronic discomfort, even after the hernia is fixed.^{5,6} All of these considerations should be assessed by and discussed with your doctor or surgeon.

HOW IS SURGERY PERFORMED?

Inguinal hernia repair is a very common operation; approximately 800,000 are performed in the USA each year.⁷ There are several techniques for treating inguinal hernias. Most involve a soft, flexible, plastic-like substance called mesh, while a few others only use sutures. The meshes used for repair of groin hernias are most often "synthetic", meant to be permanent after implantation, and are manufactured from polypropylene, polyester, or Goretex. There are several synthetic, slowly absorbable meshes available, but their long-term usefulness is under investigation. There are other types of mesh made from natural tissues ("biologic meshes"), which are uncommonly used in groin hernia repair except in the presence of a higher than normal risk of infection or by physician preference.

In order to repair a hernia, the contents of the hernia are pushed back into the abdomen and the defect in the muscular wall is repaired. When only sutures are used, it is called a "tissue repair" and the connective tissues of the abdominal wall in the groin area are sewn together to close the defect. There are several ways to close the defect with sutures only, and surgeons often have their own preference. Both inguinal and femoral hernias can be treated with some of these techniques. The major problem with primary repair is a high (up to 15%) recurrence rate, which is when the repair fails and the hernia returns.⁸ One repair technique (the "Shouldice repair") has been reported to have a low recurrence rate⁹, but this low number has only been reported at one institution and has not been reproduced elsewhere.

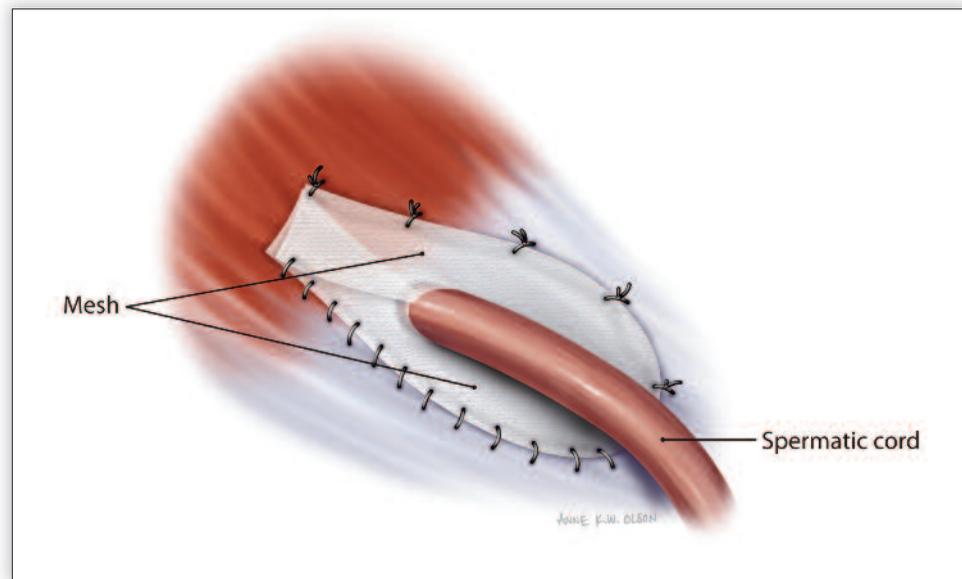
A "prosthetic" repair involves placement of mesh in order to close the hernia defect and reinforce the abdominal wall in the groin. It is the most common form of hernia repair in the modern world. Placing a mesh allows the surgeon to achieve a "tension-free" repair because the tissues do not have to be tightly sewn together with sutures. This is associated with fewer recurrences and less pain than a tissue repair. Mesh repair can be used to treat inguinal and femoral hernias.

Open vs laparoscopic repair

An open inguinal hernia repair is the traditional approach, where a small (2-3 inch) incision is made in the groin near the hernia. The hernia contents are reduced into the abdomen, and the floor of the inguinal canal is reinforced with a mesh to reduce the risk of recurrence. The Lichtenstein repair (Figure 3) or a variation of this technique, known as the "plug and patch" repair, are the common procedures. One of the newer techniques which has received acclaim includes placement of a mesh construct both just inside and outside the hernia defect, which often requires few sutures. The Ultrapro Hernia System or Gilbert repair (a surgeon for whom the technique was named) has become quite popular. The open technique can also be used for a suture-only tissue repair, but these techniques are uncommon, usually result in more post-operative pain and have a higher recurrence rate.

Laparoscopic inguinal hernia repair is a newer technique that emerged in the 1990s, where 3 small (¼ inch to ½ inch) incisions are spaced across the middle of the abdomen. A long, thin scope (attached to a camera) and specialized long, thin tools are passed through the incisions to perform the hernia repair. Laparoscopic hernia repair requires a mesh to be placed. It is secured to the abdominal wall with small permanent or absorbable tacks, sutures, special glue, or any combination of these. The laparoscopic

Figure 3. Lichtenstein Mesh Repair



repair is often quoted to result in a reduction in early post-operative discomfort and offer an earlier return to work.¹⁰ However, there is no advantage of laparoscopic or open technique in the long term.^{5,6}

There are situations where open or laparoscopic technique is preferred. If a patient needs a second operation for a failed open repair, a surgeon is more likely to choose a laparoscopic approach. The opposite is also true – in someone who had a failed laparoscopic repair, open repair is generally preferred. A patient with a groin hernia on both sides (“bilateral hernias”), he or she may benefit from a laparoscopic approach because both hernias can be fixed at 1 operation through the same small laparoscopic incisions. The open technique is often employed during emergency situations, such as with strangulated bowel, but surgeons can consider a laparoscopic approach in certain cases. In addition, some medical problems make laparoscopic surgery less advantageous. These include: patients with a high risk of bleeding from illness or medicines, patients with liver failure, and patients with heart conditions that cannot tolerate the anesthetic medications needed for complete sedation in laparoscopic surgery. Some patients with previous pelvic surgery may also be less than ideal candidates for laparoscopic surgery due to potential scarring in the groin.

Preparation for Surgery

A health history and physical exam is performed by the surgeon and sometimes an anesthesiologist prior to surgery. Depending on the patient’s age and health, blood testing, EKG, or chest X-ray, other tests may be required. An evaluation by a heart specialist may be required if there is a significant history of heart disease. There are certain medications that may need to be stopped prior to surgery. Patients should discuss their medications with their doctors. Aspirin and Plavix slow down blood clotting and, in general, are stopped 7 days prior to the procedure to decrease the risk of bleeding. Coumadin also slows down blood clotting and should be stopped 3-7 days prior to the surgery. It is extremely important to discuss these medications with doctors, as stopping these medications without substituting other medicines may be dangerous in certain situations.

Fasting is required overnight prior to morning surgeries, or at least 6 hours prior to afternoon or evening procedures. All daily medications that the doctor instructs a patient to continue can be taken on the day of surgery with a sip of water.

Recovery

In the absence of complications, patients frequently go home the same day as their surgery and medications for pain are prescribed. Some post-operative pain is expected, and the recovery time varies from patient to patient. Some patients may only need pain medications on the day of surgery and a day or two afterwards, while others may require them for 2 weeks or more. Patients may return to work a few days after the surgery if their job does not involve strenuous physical activity. Patients are often advised to limit heavy lifting or strenuous physical activity for 2-6 weeks after the procedure. After 4-6 weeks, you should be able to perform at your normal activity level (including exercising and heavy lifting).

WHAT ARE THE COMPLICATIONS OF SURGERY?

There is a risk of side-effects from anesthesia, which are the medications used to induce a sleep-like state during surgery. These risks are rare except in those patients who carry a significant history of heart or lung disease. Occasionally, patients with heart problems may need approval from a Cardiologist before surgery. Other risks involved with surgery, in general, include bleeding, infection of the skin, deeper tissues, or mesh, and blood clots in a patient’s leg or deep pelvic veins. Patients often receive antibiotics prior to surgery to attempt to prevent infection. In at risk patients, blood thinners can also be given to help prevent blood clots.

Ultimately any of the complications described above or other less common problems following surgery could lead to the most serious consequence of all, death. Intraoperative death is extremely rare during hernia surgery. Death can also occur after surgery from severe bleeding, infections, heart and circulation conditions, blood clots traveling to the lungs, or organ injury. These issues during standard inguinal hernia surgery are extremely rare.

Recurrence

Recurrence rates for inguinal hernia repair with mesh are generally low. Most studies with long-term follow-up (5 years in some cases) report recurrence rates to be between 1 and 3% for open and laparoscopic repairs. Risk factors for recurrence include older age, a family history of hernias, and smoking.^{11, 12} However, the biggest risk factor for recurrence is a history of previous recurrence.^{11, 13} Repair of a recurrent hernia is more difficult and associated with a higher failure rate than typical initial repairs.

Wound Complications

The wound complications associated with groin hernia repair include wound infections, seromas (fluid collections where the hernia use to be), and hematomas (blood collections). The incidence of these complications runs between 1 and 6%. When these occur, they are usually minor and do not require re-operation or hospitalization.¹⁴⁻¹⁶ Infection of mesh after inguinal hernia repair is a rare event (less than 0.5%), but when it happens, re-operation and mesh excision may be required.¹⁷⁻¹⁹

Ischemic orchitis

This complication of testicular ischemia is extremely rare, but may result in slow loss of testicular tissue (“atrophy”) or death of the testicle (“necrosis”), which requires removal of the testicle.^{20, 21} It may result from damage to the artery that supplies the testicles or damage to the veins that drain the testicle. This occurs more frequently in re-operative hernia repair or more complex hernias.

Scrotal edema

Swelling of the scrotum is called “scrotal edema”. This short-term problem may happen in up to 2% of all hernia repairs, but it usually resolves on its own.²²

Urinary retention

The acute inability to fully empty the bladder is known as “urinary retention”. This is also a short-term problem that can happen in 2% of groin hernia repairs. It usually resolves on its own. On occasion, patients who are unable to urinate effectively

immediately after surgery will require placement of a catheter into the bladder to drain it. This catheter may be placed and immediately removed or be allowed to stay in 24 or more hours according to the discretion of the physician.

Chronic groin pain

Chronic groin discomfort (pain lasting for months after hernia repair) affects from 7%-30% of all patients after inguinal hernia repair (laparoscopic or open)²³⁻²⁵. The actual rate of chronic discomfort often depends on how an investigator defines its presence post-operatively and how sensitive the quality of life tool is that the investigator uses. The greatest predictor of chronic groin pain after surgery is *the presence of pain before surgery*. Thus, an operation to repair the inguinal hernia may eliminate the hernia but may not necessarily eliminate the groin discomfort. Different treatment options are available for chronic groin pain, including pain medications, local injections, nerve stimulators, and surgery to remove the nerves that cause pain (“neurectomy”). These can be effective but many factors go into the successful treatment of this issue.²⁶ Chronic and/or continued discomfort is the most common complication of a groin hernia repair, and it should be taken into consideration when an operation is planned.

WHAT IS MY RISK OF CHRONIC PAIN?

There is currently a software application that many people reading this material will have utilized. The application, or app, (CeQOL - Carolinas Equation for Quality of Life – Inguinal Hernia), is available for physicians and patients alike to use on I-Phones, I-Pads, Droid smart phones, and standard tablet, laptop and desktop computers. It requests the potential patient to answer 19 short questions, and then it performs a complex mathematical equation using the patient’s answers to calculate the percentage risk of chronic discomfort following surgery. Given that surgical technique, open or laparoscopic, does not appear impact outcomes *long-term*, the app can utilize pre-operative data to make its prediction and calculate the percent chance of pain 1 year after surgery.^{5, 6, 27} The research that allowed this program to be developed came from surgeons and their patients from 30 centers in the United States, Europe, Australia and Canada. It involved over 2500 patients from who was recorded hundreds of variables about themselves, their operations, their outcomes, and their pre-operative symptoms and quality of life afterwards, both sort and long-term. The predictive CeQOL mathematical algorithm was the result of extensive analysis of this data. It was the work of the Division of Gastrointestinal and Minimally Invasive Surgery and Carolinas

Laparoscopic and Minimally Invasive Surgery Program at the Carolinas Medical Center in Charlotte, North Carolina.

The risk of chronic discomfort after inguinal hernia repair has been tied to several pre-operative patient issues, the greatest of which is pain and activity limitations before surgery. To be clear, the data strongly suggests that those with discomfort before surgery are more likely to have discomfort after surgery. Despite this, a patient with chronic discomfort and a hernia should not be dissuaded from having a hernia repair. Indeed, of those patients who have pain prior to surgery, the majority are cured of their hernia and cured of their discomfort by the operation. If one is to consider that patients with discomfort prior to surgery have a 100% chance of pain and/or movement limitations without surgery, an operation, which often carries a low chance of complications otherwise, is the best way to improve one's quality of life.

The patient's age and gender also have an effect on quality of life following surgery, and CeQOL takes this into account. Bilateral hernias and recurrent hernias also impact chronic discomfort. Again, these variables are part of the equation that aids to predict the quality of life outcome. It should be stated that the CeQOL app is not meant to replace an examination by a surgeon. The assessment of risk, consideration of future issues and problems associated with the hernia, and operative options should be discussed with the operating surgeon.

SUMMARY

An inguinal hernia is a very common problem, and surgery is the only definitive treatment. However, not all hernias need to be repaired surgically. A repair reinforced with a prosthetic mesh is associated with a lower recurrence rate, less discomfort immediately after the operation, and is generally recommended. Laparoscopic and open repair of groin hernias are both good options, and the choice of technique needs to be individualized for each patient. Chronic discomfort is the most common complication associated with a groin hernia repair, and the CeQOL app can aid patients and physicians alike in predicting outcomes as it relates to quality of life. This app is not meant to replace an evaluation and conversation with a surgeon; that is the most predictive aspect of any operation. A surgeon's assessment of risk and possible outcomes as derived from their training and experience will be a key in the decision making process. The CeQOL app is meant to be an adjunct to that conversation.

REFERENCES:

1. Rutkow IM, Robbins AW. Demographic, classificatory, and socioeconomic aspects of hernia repair in the United States. *Surg Clin North Am.* Jun 1993;73(3):413-426.
2. McIntosh A, Hutchinson A, Roberts A, Withers H. Evidence-based management of groin hernia in primary care--a systematic review. *Fam Pract.* Oct 2000;17(5):442-447.
3. Fitzgibbons RJ, Jr., Giobbie-Hurder A, Gibbs JO, et al. Watchful waiting vs repair of inguinal hernia in minimally symptomatic men: a randomized clinical trial. *JAMA.* Jan 18 2006;295(3):285-292.
4. Dahlstrand U, Wollert S, Nordin P, Sandblom G, Gunnarsson U. Emergency femoral hernia repair: a study based on a national register. *Ann Surg.* Apr 2009;249(4):672-676.
5. Belyansky I, Tsirlina VB, Klima DA, Walters AL, Lincourt AE, Heniford TB. Prospective, comparative study of postoperative quality of life in TEP, TAPP, and modified Lichtenstein repairs. *Ann Surg.* Nov 2011;254(5):709-714; discussion 714-705.
6. Belyansky I, Tsirlina VB, Walters AL, Colavita PD, Zemlyak AY, Lincourt AE, Heniford BT. *Algorithmic Prediction of Chronic Pain after an Inguinal Hernia Repair.* NY: International Hernia Congress; 2012.
7. Rutkow IM. Demographic and socioeconomic aspects of hernia repair in the United States in 2003. *Surg Clin North Am.* Oct 2003;83(5):1045-1051, v-vi.
8. Scott NW, McCormack K, Graham P, Go PM, Ross SJ, Grant AM. Open mesh versus non-mesh for repair of femoral and inguinal hernia. *Cochrane Database Syst Rev.* 2002(4):CD002197.
9. Glassow F. The Shouldice Hospital technique. *Int Surg.* Jul-Sep 1986;71(3):148-153.
10. Gong K, Zhang N, Lu Y, et al. Comparison of the open tension-free mesh-plug, transabdominal preperitoneal (TAPP), and totally extraperitoneal (TEP) laparoscopic techniques for primary unilateral inguinal hernia repair: a prospective randomized controlled trial. *Surg Endosc.* Jan 2011;25(1):234-239.
11. Junge K, Rosch R, Klinge U, et al. Risk factors related to recurrence in inguinal hernia repair: a retrospective analysis. *Hernia.* Aug 2006;10(4):309-315.
12. Jansen PL, Klinge U, Jansen M, Junge K. Risk factors for early recurrence after inguinal hernia repair. *BMC Surg.* 2009;9:18.
13. Matthews RD, Anthony T, Kim LT, et al. Factors associated with postoperative complications and hernia recurrence for patients undergoing inguinal hernia repair: a report from the VA Cooperative Hernia Study Group. *Am J Surg.* Nov 2007;194(5):611-617.

14. Paaajanen H, Varjo R. Ten-year audit of Lichtenstein hernioplasty under local anaesthesia performed by surgical residents. *BMC Surg.* 2010;10:24.
15. Messaris E, Nicastrì G, Dudrick SJ. Total extraperitoneal laparoscopic inguinal hernia repair without mesh fixation: prospective study with 1-year follow-up results. *Arch Surg.* Apr 2010;145(4):334-338.
16. Chen J, Lv Y, Shen Y, Liu S, Wang M. A prospective comparison of preperitoneal tension-free open herniorrhaphy with mesh plug herniorrhaphy for the treatment of femoral hernias. *Surgery.* Nov 2010;148(5):976-981.
17. Ergul Z, Akinci M, Ugurlu C, Kulacoglu H, Yilmaz KB. Prophylactic antibiotic use in elective inguinal hernioplasty in a trauma center. *Hernia.* Sep 18 2011.
18. Rehman S, Khan S, Pervaiz A, Perry EP. Recurrence of inguinal herniae following removal of infected prosthetic meshes: a review of the literature. *Hernia.* Aug 20 2011.
19. Shankar VG, Srinivasan K, Sistla SC, Jagdish S. Prophylactic antibiotics in open mesh repair of inguinal hernia - a randomized controlled trial. *Int J Surg.* 2010;8(6):444-447.
20. Fong Y, Wantz GE. Prevention of ischemic orchitis during inguinal hernioplasty. *Surg Gynecol Obstet.* May 1992;174(5):399-402.
21. Moore JB, Hasenboehler EA. Orchiectomy as a result of ischemic orchitis after laparoscopic inguinal hernia repair: case report of a rare complication. *Patient Saf Surg.* 2007;1(1):3.
22. Forte A, D'Urso A, Gallinaro LS, et al. [Complications of inguinal hernia repair]. *G Chir.* Mar 2002;23(3):88-92.
23. Kim-Fuchs C, Angst E, Vorburger S, Helbling C, Candinas D, Schlumpf R. Prospective randomized trial comparing sutured with sutureless mesh fixation for Lichtenstein hernia repair: long-term results. *Hernia.* Feb 2012;16(1):21-27.
24. Pierides G, Vironen J. A prospective randomized clinical trial comparing the Prolene Hernia System(R) and the Lichtenstein patch technique for inguinal hernia repair in long term: 2- and 5-Year results. *Am J Surg.* Aug 2011;202(2):188-193.
25. Kumar S, Wilson RG, Nixon SJ, Macintyre IM. Chronic pain after laparoscopic and open mesh repair of groin hernia. *Br J Surg.* Nov 2002;89(11):1476-1479.
26. Keller JE, Stefanidis D, Dolce CJ, Iannitti DA, Kercher KW, Heniford BT. Combined open and laparoscopic approach to chronic pain after inguinal hernia repair. *Am Surg.* Aug 2008;74(8):695-700; discussion 700-691.
27. Heniford BT. American Hernia Society Presidential Address. *International Hernia Congress.* 03/29/2012.

CHAPTER 2

Umbilical Hernias

Umbilical Hernias

WHAT IS AN UMBILICAL HERNIA?

An umbilical hernia is caused by a weakness of the connective tissue and abdominal muscles around the belly button (also known as the “umbilicus”). This weakness creates an opening, known as a defect, which allows for underlying fat or intestine to protrude through the abdominal wall and form a bulge under the skin in or around your belly button (Figure 1A). Umbilical hernias are frequently seen in children, but they are also common in adults. In children, the defects often close with age and may not require surgery. In adults, umbilical hernias do not heal themselves and can only be repaired with surgery.

Figure 1A. Anatomy



WHAT ARE THE SYMPTOMS OF AN UMBILICAL HERNIA?

Common signs and symptoms include:

- A bulge in or near the belly button
- Abdominal pain or pressure, which may worsen when coughing or straining

WHAT CAUSES AN UMBILICAL HERNIA?

There are two types of umbilical hernias: congenital and acquired. A congenital umbilical hernia is present at birth. The umbilical cord was attached at the belly button during development in the womb, and a natural opening in the muscles exists at this site because of the blood vessels entering the fetus while in the womb. When this area of muscle does not close completely after birth, a congenital umbilical hernia can form. Typically, children without symptoms of their hernia can be watched until they reach school age before considering repairing them.

Acquired umbilical hernias develop over time in adults from age or injury that lead to an opening in the muscle under or adjacent to the belly button. Conditions that increase pressure in the abdomen contribute to the development of the hernia because the pressure stretches this area of natural weakness. Continued exertion or weight gain increases the size of the defect and can push intestines or other organs through the opening. Many of these conditions are listed below.

WHAT ARE THE RISK FACTORS FOR DEVELOPING AN UMBILICAL HERNIA?

Risk factors for developing an umbilical hernia include:

- Chronic cough
- Smoking
- Obesity
- Straining while lifting heavy objects
- Straining during bowel movements
- Pregnancy
- Certain medications, such as steroids
- Born prematurely

WHAT ARE THE TREATMENT OPTIONS?

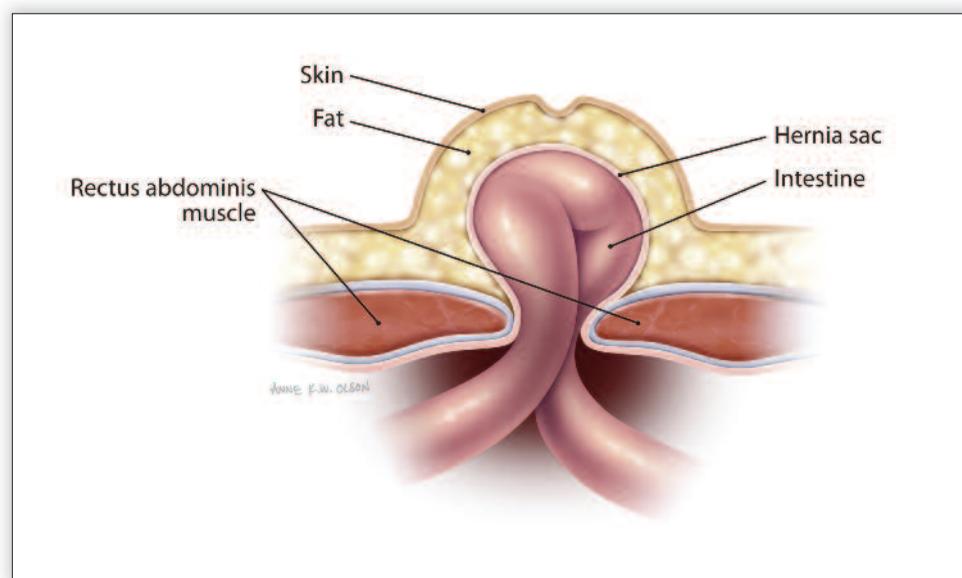
The treatment for adults with umbilical hernias is surgery. Congenital umbilical hernias in children usually heal as they grow older, without surgery. Generally, children

younger than 5 years old do not require surgery. Children born with umbilical hernia defects larger than 1 cm in diameter are less likely to close on their own and may require surgery².

WHAT ARE THE RISKS OF NOT HAVING SURGERY?

Small, asymptomatic hernias can often be observed and surgery can be avoided, even in adults. But, as previously mentioned, these hernias do not heal themselves and all will slowly enlarge over time. The most serious risk of non-surgical management is that intestine or other organs can become stuck in the hernia. Usually, the hernia contents can be pushed back into the abdomen (“reducing” the hernia) (Figure 1B). When this cannot be done, the hernia is called “incarcerated”. Incarceration can lead to obstruction or blockage of the intestine in the hernia. This can result in nausea, vomiting, and abdominal pain. Incarceration can also cut off the blood supply to the intestines; this is called “strangulation”. Strangulation can lead to death of the effected section of intestines and is a surgical emergency. If this is not treated quickly, it can lead to serious complications for the patient or death.

Figure 1B. Internal Anatomy



Umbilical hernias may close without surgery in children up to the age of 14, but surgical repair must be strongly considered before starting school as children in this age group have a high risk of incarceration³.

WHAT ARE THE SURGICAL OPTIONS AND HOW ARE THEY PERFORMED?

There are two main approaches to umbilical hernia repair: “open” and “laparoscopic” techniques.

Open technique

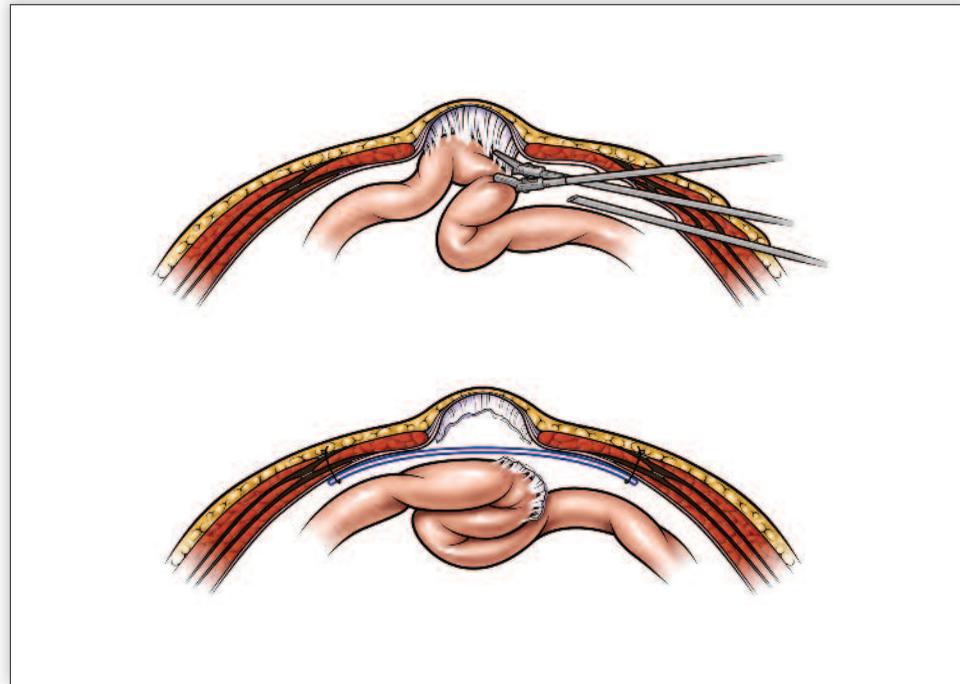
The open technique is the traditional approach that people think of when imagining surgery. An incision is made in the skin near the hernia, and the intestine or fat protruding through the muscle is reduced into the abdomen. The defect in the abdominal wall is then repaired through the incision, and the skin is closed over the repair.

There are two options for repairing the defect with the open technique. The first uses only sutures to bring the muscles and connective tissue back together. For larger hernias, this can create tension in the repairs, which contributes to a failed repair and return of the hernia, known as “recurrence”. Mesh is a soft and flexible, woven, plastic-like material that has been used to repair hernias since the 1950’s. The use of mesh has greatly reduced the rate of recurrence in all hernia repairs. Some surgeons recommend using mesh for all umbilical hernia repairs, and others only recommend its use in larger defects^{4,5}. We typically use mesh in larger defects or those that appear as if they may have a higher risk of recurrence. There are many types of mesh, and most are well accepted by the body and allow natural tissues to grow into them. They are used to reinforce the closure of the umbilical defect. A discussion with a surgeon can help a patient decide if mesh is necessary and what type is most appropriate.

Laparoscopic technique

Laparoscopic, or minimally invasive, surgery is another hernia repair option. During laparoscopic surgery, 3 to 4 small incisions are made in different parts of the abdomen so that specialized long, thin instruments and video camera can be inserted (Figure 2). The abdomen is temporarily inflated with gas to give the surgeon space to work under the abdominal wall.

Figure 2. Laparoscopic umbilical hernia repair with mesh



The hernia can be repaired with mesh alone or sutures with mesh. In the open technique, mesh may be secured to the abdominal wall with sutures. In the laparoscopic approach, sutures, short cork-screw shaped tacks, or a combination of both can be used to secure the mesh. Occasionally, in either open or laparoscopic procedures, a special glue is used with or without sutures or tacks to hold the mesh in place.

PREPARATION FOR SURGERY

Health history and physical exam should be performed by a surgeon and, sometimes, an anesthesiologist prior to surgery. Depending on the patient's age and health, blood testing, urinalysis, EKG, chest X-ray, or other tests may be required. An evaluation by a heart specialist may be needed if particular types of heart disease are

present. There are certain medications that may need to be stopped prior to surgery. Patients must discuss their medications with the doctors. They should not stop any medications without their doctor's instruction. Aspirin and Plavix slow down blood clotting and, in general, these medications are stopped 7 days prior to the procedure to decrease the risk of bleeding. Coumadin also slows down blood clotting and should be stopped at least 3-5 days prior to the surgery. It is extremely important to discuss these medications with doctors, as stopping these medications without substituting other medicines may be dangerous in certain situations.

Fasting is required overnight prior to morning surgeries, or at least 6 hours prior to afternoon or evening procedures. All daily medications that the doctor instructs a patient to continue can be taken on the day of surgery with a sip of water.

Recovery

In the absence of complications, most patients usually go home the same day as their surgery. All patients are discharged home with pain medication. Some post-operative pain is expected, and the recovery time varies from patient to patient. Some patients may only need pain medications on the day of surgery, while others may require them for up to 2 weeks after the operation. Patients may return to work a few days after the surgery if their job does not involve strenuous physical activity. The return to full physical activity (including exercising and heavy lifting) may be delayed as long as 6 weeks after the hernia repair.

WHAT ARE THE COMPLICATIONS OF SURGERY?

There is a risk of side-effects from anesthesia, which are the medications used to induce a sleep-like state during surgery. While very uncommon, a combination of anesthesia and the surgery itself can cause heart issues in patients with significant heart disease, and some may need approval from a cardiologist before surgery. Other risks involved with surgery, in general, include bleeding or infection of the skin, deeper tissues, or mesh. Deep venous thrombosis or blood clots in the deep veins of the legs or pelvis due to not moving during surgery or in the days that follow are rare following an operation to repair an umbilical hernia. Patients often receive antibiotics prior to surgery to attempt to prevent infection. Blood thinners can also be given to prevent blood clots. There is also a chance that underlying organs could be injured during a hernia repair, but this, too, is quite uncommon. Ultimately, any of the complications described above could lead to the most serious consequence of all, death. Death is extremely rare during or following hernia surgery.

Recurrence

The use of mesh has drastically changed the surgical approach to the umbilical hernia repair and has reduced the rate of hernia recurrence from 11% to 1%. There is a debate between surgeons whether or not mesh is needed for very small defects, which have been shown to have very low recurrence rates with suture-only repair in some studies⁴⁻⁶.

Wound Complications

The wound complications associated with an umbilical hernia repair include wound infections, seromas (fluid collections), and hematomas (blood clots). However, the rates of these complications are low and have been reported to be around 4.5% when mesh is used^{4,6,7}. Infection of the mesh used in the hernia repairs can also occur. This can be treated with antibiotics, but may require removal of the mesh in the operating room.

Ileus

In surgeries that involve the intestines or simply manipulating them, a condition known as an “ileus” can occur. An ileus is when the intestines are somewhat paralyzed and do not move in a coordinated manner; this leads to food build-up in the intestines, nausea, and, possibly, vomiting. An ileus gets better with time, but may require dietary restrictions or possibly a tube placed through a patient’s nose and into the stomach to help decompress the food build-up in cases of nausea and vomiting until normal bowel function returns.

Intestinal adhesions

Bowel can also adhere to sutures or the mesh, if placed inside the abdomen. These adhesions can lead to kinking of the bowel in the future, which can cause an intestinal obstruction, but this is extremely uncommon following umbilical hernia surgery.

Chronic pain

Chronic pain is pain present 3 months after surgery. This is not common following repair of an umbilical hernia. It can occur where a suture is placed to close the defect or suture sites associated with mesh placement. When present, it is most often treated successfully with an injection of a local anesthetic in the abdominal muscle during an outpatient follow-up visit⁸. Other times, there is no clear explanation. Patients with umbilical pain before surgery are more likely to have chronic discomfort than patients without preoperative symptoms.

SUMMARY

Umbilical hernias are very common problems. Surgery is the only definitive treatment for an adult with an umbilical hernias. Not all hernias need to be immediately repaired, but they tend to grow over time and always carry a risk of incarceration or strangulation, which can lead to a life-threatening situation requiring emergent surgery. Repair of hernias can be performed either open or laparoscopically. When electively repaired, umbilical hernia repair reinforced with a prosthetic mesh is associated with a very lower recurrence rate and is often recommended.

RECOMMENDED REFERENCES AND READINGS

1. Halpern LJ. Spontaneous healing of umbilical hernias. *JAMA*. Nov 24 1962;182:851-852.
2. Walker SH. The natural history of umbilical hernia. A six-year follow up of 314 negro children with this defect. *Clin pediatr (phila)*. Jan 1967;6(1):29-32.
3. Bevacqua J. Umbilical hernias in infants and children. *Nurse pract*. Dec 2009;34(12):12-13.
4. Arroyo A, Garcia P, Perez F, Andreu J, Candela F, Calpena R. Randomized clinical trial comparing suture and mesh repair of umbilical hernia in adults. *Br j surg*. Oct 2001;88(10):1321-1323.
5. Thoman DS. Randomized clinical trial comparing suture and mesh repair of umbilical hernia in adults (*br j surg* 2001;88:1321-3). *Br j surg*. May 2002;89(5):627; author reply 628.
6. Aslani N, Brown CJ. Does mesh offer an advantage over tissue in the open repair of umbilical hernias? A systematic review and meta-analysis. *Hernia*. Oct 2010;14(5):455-462.
7. Martin DF, Williams RF, Mulrooney T, Voeller GR. Ventralex mesh in umbilical/epigastric hernia repairs: clinical outcomes and complications. *Hernia*. Aug 2008;12(4):379-383.
8. Carbonell AM, Harold KL, Mahmutovic AJ, et al. Local injection for the treatment of suture site pain after laparoscopic ventral hernia repair. *Am surg*. Aug 2003;69(8):688-691; discussion 691-682.
9. Muysoms FE, Bontinck J, Pletinckx P. Complications of mesh devices for intraperitoneal umbilical hernia repair: a word of caution. *Hernia*. Jun 17 2010.

CHAPTER 3 Ventral Hernias

Ventral Hernias

WHAT IS A VENTRAL HERNIA?

Ventral hernias are holes or openings through the muscle and strong connective tissue of the abdominal wall. They can form essentially anywhere in the abdomen. Hernias can occur on their own, or they can occur at the location of an incision. They are caused by a weakness in the abdominal wall that allows organs, such as intestines or fatty tissue, to protrude through the weakened area. This often creates a bulge under the skin (Figure 1).

A hernia forming after surgery through the site of an incision is known as an “incisional” hernia. After any surgery, incisional hernias form between 3% and 20% of the time. These occur most often after a long incision in the middle of the abdomen, but they can occur through incisions anywhere on the abdomen¹⁻³. Sometimes these hernias form only in part of the incision. For example, a long incision in the middle of the abdomen can lead to a small hernia anywhere along the scar: above the belly button, below the belly button, or under the sternum (Figure 1).

Hernias that occur on their own (no previous surgery at the hernia site) can also occur anywhere on the abdominal wall. These are often due to weaknesses in the abdominal wall present at birth. As patients get older or become injured, these weaknesses can worsen, leading to a hernia. These hernias can occur at the belly button (umbilical), in the groin (inguinal), or near the hip bone (spigelian); these specific hernias are described in other chapters. This chapter will discuss hernias that occur in the midline of the abdomen and those that occur at the flanks, under the ribs at the sides of the abdomen, as well as “incisional” hernias.

WHAT IS A RECURRENT HERNIA?

A recurrent hernia is a hernia that has been repaired in the past, but the previous repair failed and the patient’s hernia is once again present.

WHAT IS “MESH”?

Mesh is a device that is used very frequently in hernia repair. It is a thin knitted material that is used to increase the strength of a hernia repair. Mesh can be made from many different substances. “Synthetic” meshes are made from soft, flexible, plastic-like

Figure 1. Ventral Hernia



materials; some of these are permanent and some dissolve. “Biologic” meshes are made from connective tissue (collagen) that often comes from skin. Biologic meshes are more expensive, but are more resistant to infection, in general. Both types of meshes can fail and lead to a recurrent hernia. Biologic meshes are more likely to bulge with time, even when the hernia has not truly recurred.

WHO IS MORE LIKELY TO GET A HERNIA?

Risk factors for hernia development may include chronic cough, smoking, obesity, straining while lifting heavy objects, straining during bowel movements or urination, pregnancy, and certain medications, such as steroids.

Incisional hernias can occur after any surgery, but they are more common in certain patients. Older age, obesity, diabetes, steroid use (steroid pills and injections used for chronic diseases), lung disease, smoking, and an infection in the incision have all been linked to increased hernia rates.

HOW COMMON ARE VENTRAL HERNIA SURGERIES?

An estimated 348,000 ventral hernia repairs (VHR) were performed in 2006 in the United States⁴, and it has been projected that 300,000 VHR are performed annually in Europe⁵.

WHAT ARE TREATMENT OPTIONS?

The treatment of ventral hernias is surgical, and most patients undergo repair, but not all patients require treatment. Later in this chapter, we will discuss non-surgical management of hernias, as well as the risks of avoiding surgery and the risks of surgery itself. In the past, before appropriate meshes and techniques for implanting them were available, sutures alone were used to close the weaknesses in the abdominal wall. These often were unsuccessful in the long-term, as most patients' hernias would recur. For some very small ventral hernias, suturing alone remains acceptable. It is more appropriate in most cases for hernias to be reinforced with mesh. In the 1950's, surgeons began using an early variation of the mesh that is commonly used today. Since that time, surgeons have developed sophisticated techniques for placing and securing mesh to the abdominal wall and have documented that we can significantly reduce hernia recurrences with mesh. The meshes that are implanted have also become more highly developed and afford surgeons greater options to help their patients.

Traditionally, hernias are repaired by making an incision over the hole or defect in the abdominal wall. The intestines, fat, or other organs in the hernia are placed back in the abdomen. The muscular defect is then closed with sutures alone or is reinforced with a piece of mesh. The mesh is attached to the abdominal wall with suture to keep it in place. The abdominal wall is then closed with suture over the mesh. Often, temporary drainage tubes are placed through the skin to prevent fluid build-up within the abdominal wall. (Figure 2).

In the 1990's, laparoscopic hernia repairs were first described. This technique is also known as "minimally invasive". It involves three or four small incisions in separate areas of the abdomen. A small camera and thin tools, such as small graspers and scissors, are passed through the small holes to perform the hernia repair. Just like the traditional repair, the intestines, fat, or other organs are pulled back into the abdomen. The muscle weakness is then covered with a mesh or, if possible, it is closed with suture followed by a reinforcing mesh to cover the weak area. Sutures, short tacks (shaped like tiny corkscrews), or glue can be used to attach the mesh to the abdominal wall⁶. (Figure 3).

Figure 2. Open ventral hernia repair

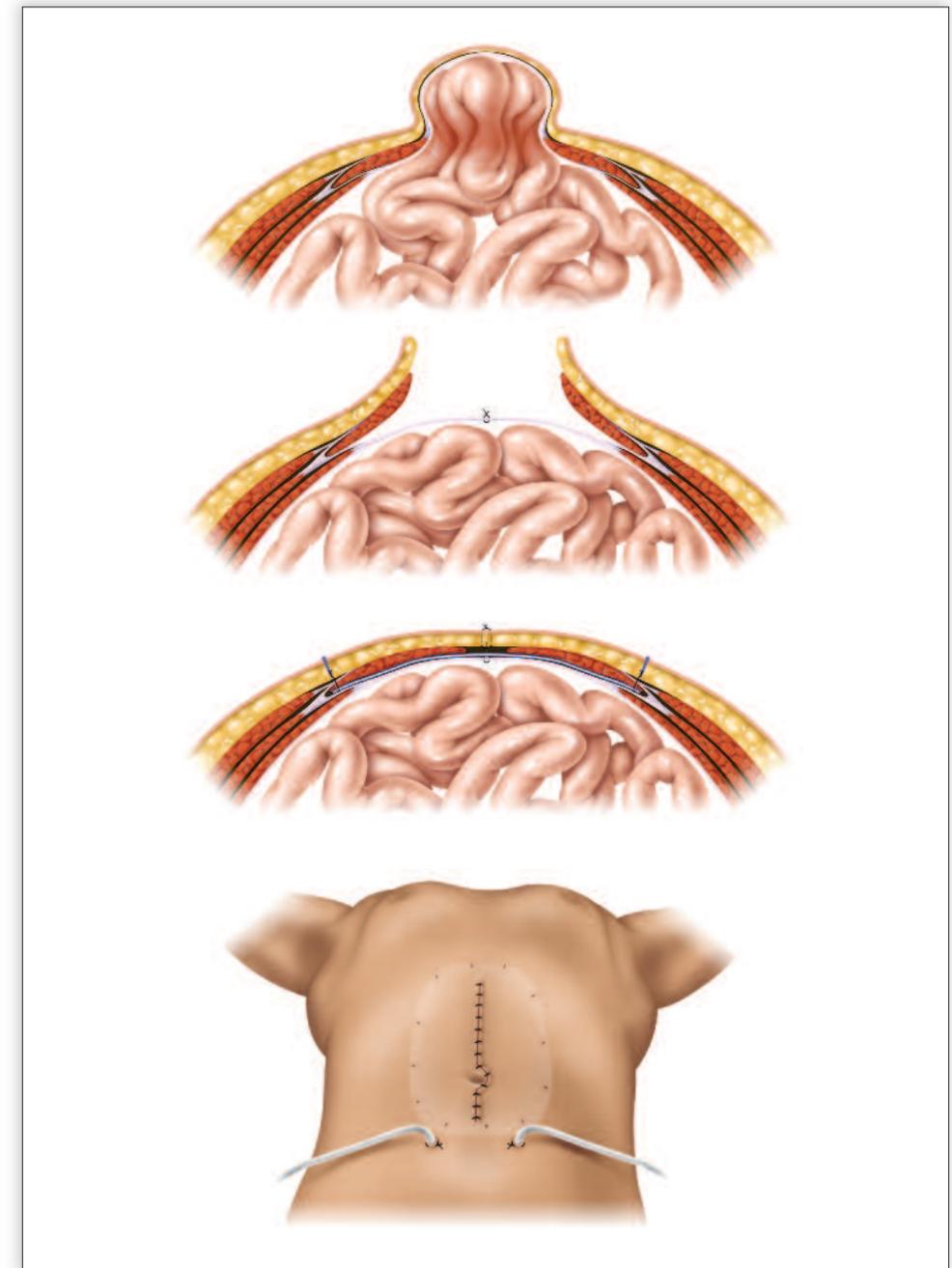
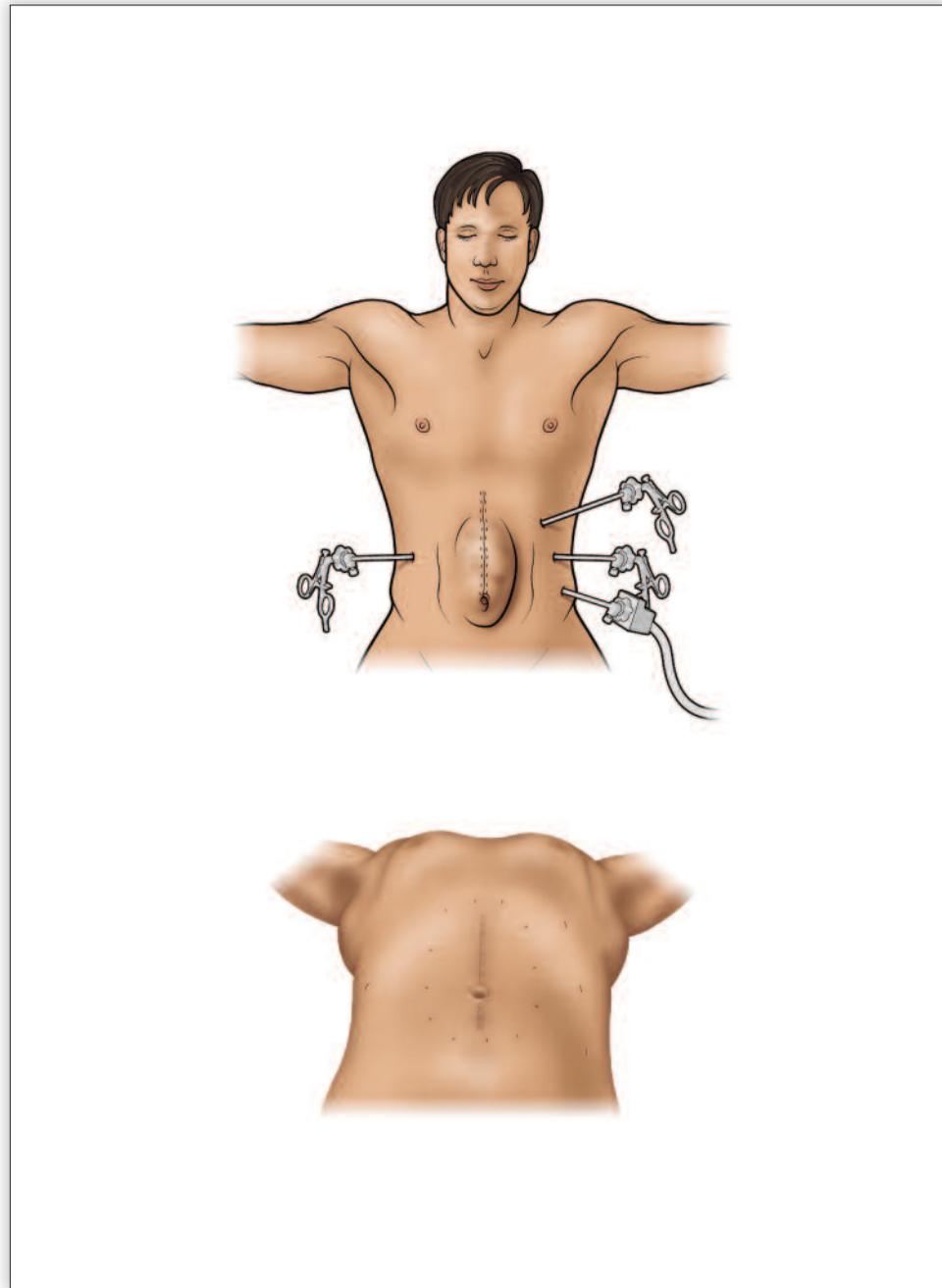


Figure 3. Laparoscopic ventral hernia repair



WHAT ARE THE DIFFERENCES BETWEEN THE TWO REPAIR TECHNIQUES?

Open and laparoscopic techniques do offer some differences in outcomes. Most of the literature comparing the two techniques supports a shorter hospital stay⁶⁻¹⁵ and a slightly lower rate of infection after laparoscopic surgery^{6,7,14-20}. However, open surgery almost always allows a patient to have their muscle closed over the mesh, which is quite uncommon in laparoscopic surgery. Because the laparoscopic approach requires the use of spiral-shaped, small tacks to hold the mesh in place, the laparoscopic repair results in more discomfort than open surgery, which can last in excess of a month after surgery⁷. In patients that have a hernia in a previous incision, open surgery can often offer a better cosmetic result because the previous scar can be removed at the time of surgery. Studies have provided mixed results for some other outcomes, but the rate of recurrence is very close to equal between methods⁷. It is appropriate to discuss both methods with your surgeon to determine which is best for you.

WHAT ARE THE RISKS OF NOT HAVING SURGERY?

All types of hernias have a risk of intestines or other organs being trapped within the hernia. In ventral hernias, this may be more common with smaller defects. When organs are trapped and cannot be pushed back into the abdomen, the trapped tissues are said to be “incarcerated”. If this limits the blood supply to the tissues, the trapped intestine or fat becomes “strangulated”, which is a surgical emergency and can become life threatening if not treated quickly.

Ventral hernias that do not become incarcerated are called “reducible” because the hernia can be “reduced” or pushed back into the abdomen. After being reduced, hernias will soon bulge once again. As long as they are freely reducible, ventral hernias can be observed. Often even patients with reducible ventral hernias will still seek surgery due to the presence of symptoms, such as pain, activity limitation, or simply poor cosmetics.

Unfortunately, however, untreated hernias increase in size with time, do not fix themselves, and leave the patient at risk for complications. Studies have shown that larger hernias are associated with more complications, more pain after surgery, and have a higher rate of failure and recurrence after surgery. Most patients elect to undergo surgery for an asymptomatic hernia to avoid the increasing risks associated with repair of a larger hernia defect in the future and the risk of incarceration now.

WHAT ARE THE RISKS OF VENTRAL HERNIA SURGERY?

All surgeries have risks associated with them. The risks, benefits, and alternatives to ventral hernia repair should be discussed by the surgeon. The details contained in this section of the chapter are meant to be a broad overview of the many possible complications. Many of these complications are very rare, but are included as possible discussion points with a doctor.

There is a risk of side-effects from anesthesia, which are the medications used to induce a sleep-like state during surgery. Anesthesia or surgery can stress someone's heart if they have a history of specific types of heart problems; patients with heart disease, a history of a heart attack, or other problems may need approval from a cardiologist before surgery. Other risks involved with surgery, which are general risks in any operation, include bleeding, infection of the skin, deeper tissues, or even the mesh. Another possible problem includes development of blood clots in the big veins in a patient's legs or pelvic veins due to immobility around the time of surgery. Patients often receive antibiotics prior to surgery to attempt to prevent infection. Blood thinners and the placement of compression stockings on someone's calves can also be given to prevent blood clots.

Wound complications

Skin-level wound infections do not occur often after ventral hernia repairs, but they are a possible complication. This is more common in very large hernias. Other wound-related complications are also possible. A common issue after surgery is the development of fluid where the hernia used to be. This fluid, called a seroma, is most often found between the skin and the abdominal wall muscle or the mesh.

One of the most important factors that contribute to infections is smoking²¹. If someone smokes, it is important to reduce this as much as possible. Optimally, it would be best to completely quit for 3 weeks prior to surgery, which can substantially decrease the risk of infection.

Mesh Infection

Infection of the mesh used in the hernia repairs can also occur. This can be treated with antibiotics, but could require removal of the mesh in the operating room. Increased rates of mesh infection are associated with diabetes, smoking, obesity, chronic lung diseases, and a decreased immune system (from some chronic diseases or certain medications).

Recurrence

There is also a risk of recurrence, or failure of the hernia repair. Studies report varying recurrence rates, but laparoscopic and open repairs have similar recurrence rates in many studies⁷.

Ileus

In some ventral hernia surgeries the intestines are often manipulated, and subsequently, a condition known as an "ileus" can occur. An ileus is when the intestines simply slow down and stop working in a coordinated manner. This can lead to food build-up in the intestines, nausea, and vomiting. An ileus gets better with time, but may require restrict eating or be without food or drink completely for a while. Infrequently, a tube placed through the nose and down into the stomach to help decompress the intestine in cases of nausea and vomiting until normal bowel function returns. Normal intestinal function can occur in 24 hours or might take a few days or anything in-between.

Intestinal Adhesions

Following any abdominal surgery, intestinal adhesions can occur. This is uncommon in small hernias where mesh is not placed in contact with the intestine. The development of scar tissue inside the abdomen is more common after someone has had a previous operation. Adhesions can develop between the mesh and the intestine when mesh is placed inside the abdomen; this less likely today due to the availability of specialized meshes that have an anti-adhesive barrier on the side that faces the internal organs.

Injury to Abdominal Organs

Abdominal organs are also at risk during hernia operations. Injury to the intestines, colon, or any other organ is possible when operating in the abdomen. These injuries are rare, are repaired when they occur, but can be very serious if they are not noted at the time of surgery. On occasion, injured bowel can lead to a communication of the intestines with the skin; this is known as a "fistula". This is also rare, and they can heal on their own, but fistulas often require surgery.

Death

Ultimately any of the complications described above could lead to the most serious consequence of all, death. Death is extremely rare during hernia surgery. It can occur from heart and circulation conditions, blood clots traveling to the lungs, bleeding, infections, or organ injury.

Chronic Pain

A complication that is not always considered is the risk of chronic discomfort following surgery, which can adversely affect a patient's quality of life in general. Chronic discomfort (pain present longer than 3 months after surgery) must be distinguished from short-term pain. All patients will have pain the day of surgery, some patients recover in a few days, while others can have significant discomfort for a few weeks. Pain medication is needed and given to nearly every patient after surgery. In general, patients complain of less pain 1 month after surgery than before the operation. Patients who have laparoscopic repairs complain of pain and activity limitation more frequently than patients who have open surgery in the short-term. By six months, bothersome symptoms are less frequent for both laparoscopic and open repairs, and there is no quality of life difference between repair methods⁷.

WHAT IS THE RISK OF CHRONIC PAIN?

In general, patients with pain before surgery are more likely to have pain after surgery. There are other factors that contribute to pain after ventral hernia repair, as well. Currently, a computerized equation is being developed where patients or physicians can answer short questions about these factors and the percent chance of pain lasting 1 year will be calculated. This equation is being created using data contained in a very large international database. There is already an equation available for calculating this risk after groin hernia repair.

WHAT CAN BE DONE TO REDUCE THE RISK OF OTHER COMPLICATIONS?

Overall complication rates are considered to be low. Skin and wound complications are more common, but there are risk factors that can be modified. For example, quitting smoking for 3 weeks prior to surgery has been shown to reduce wound complications²². Weight loss and good control of diabetes are also associated with lower wound complications.

HOW DO I PREPARE FOR SURGERY AND WHAT IS THE RECOVERY PERIOD AFTER SURGERY?

Preparation for Surgery

Health history and physical exam should be performed by a surgeon and sometimes an anesthesiologist for every patient prior to surgery. Depending on the patient's age and health, blood testing, urine testing, EKG, chest X-ray, or other tests may be required. An evaluation by a heart specialist may be required if there is a significant history of certain heart problems. There are certain medications that may need to be stopped prior to surgery. Patients should discuss their medications with the doctors. They should not stop medications without their doctor's instruction. Aspirin and Plavix slow down blood clotting and, in general, these medications are stopped 7 days prior to the procedure to decrease the risk of bleeding. Coumadin also slows down blood clotting and should be stopped 3-6 days prior to the surgery. It is extremely important to discuss these medications with doctors, as stopping these medications without substituting other medicines may be dangerous in certain situations.

Fasting is required overnight prior to morning surgeries, or at least 6 hours prior to afternoon or evening procedures. All daily medications that the doctor instructs a patient to continue can be taken on the day of surgery with a sip of water.

Recovery

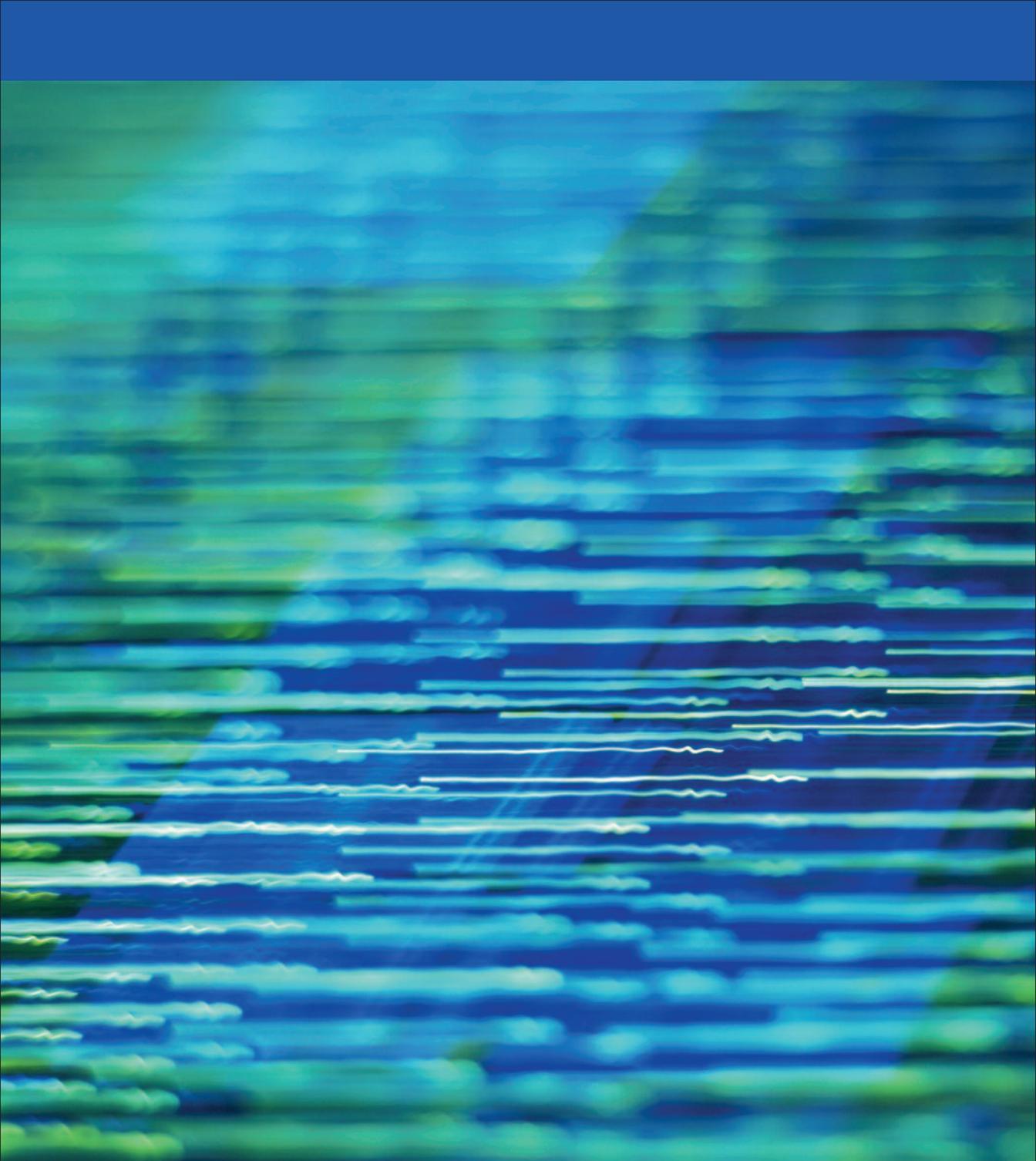
The length of hospital stay varies after surgery. Some patients may go home on the day of surgery after small ventral hernia repairs. Other patients may stay in the hospital for several days to a week or more after repair of a large, complicated ventral hernia. After surgery, patients may return to work when they feel able to do so. This may take anywhere from a few days for small hernias to a several weeks for larger hernias. All patients are instructed to avoid heavy lifting and straining for 6 weeks after surgery.

SUMMARY

Ventral hernias are common problems. Surgery is the only definitive treatment for ventral hernias, but not all hernias have to be repaired. Repair reinforced with a prosthetic mesh is associated with a lower recurrence rate and is generally recommended. Laparoscopic and open repair of ventral hernias are both good options with each having its own set of advantages.

REFERENCES

1. Carlson MA, Ludwig KA, Condon RE. Ventral hernia and other complications of 1,000 midline incisions. *South Med J*. Apr 1995;88(4):450-453.
2. Mudge M, Hughes LE. Incisional hernia: a 10 year prospective study of incidence and attitudes. *Br J Surg*. Jan 1985;72(1):70-71.
3. Read RC, Yoder G. Recent trends in the management of incisional herniation. *Arch Surg*. Apr 1989;124(4):485-488.
4. Poulouse BK, Shelton J, Phillips S, et al. Epidemiology and cost of ventral hernia repair: making the case for hernia research. *Hernia*. Sep 9 2011.
5. Sauerland S, Walgenbach M, Habermalz B, Seiler CM, Miserez M. Laparoscopic versus open surgical techniques for ventral or incisional hernia repair. *Cochrane Database Syst Rev*. 2011(3):CD007781.
6. Heniford BT, Park A, Ramshaw BJ, Voeller G. Laparoscopic repair of ventral hernias: nine years' experience with 850 consecutive hernias. *Ann Surg*. Sep 2003;238(3):391-399; discussion 399-400.
7. Colavita PD, Tsirlina VB, Belyansky I, Walters AL, Lincourt AE, Sing RF, Heniford BT. Prospective, Long-term Comparison of Quality of Life in Laparoscopic Versus Open Ventral Hernia Repair. *Ann Surg* (Submitted). 2012.
8. Beldi G, Ipaktchi R, Wagner M, Gloor B, Candinas D. Laparoscopic ventral hernia repair is safe and cost effective. *Surg Endosc*. Jan 2006;20(1):92-95.
9. Pierce RA, Spitler JA, Frisella MM, Matthews BD, Brunt LM. Pooled data analysis of laparoscopic vs. open ventral hernia repair: 14 years of patient data accrual. *Surg Endosc*. Mar 2007;21(3):378-386.
10. Lomanto D, Iyer SG, Shabbir A, Cheah WK. Laparoscopic versus open ventral hernia mesh repair: a prospective study. *Surg Endosc*. Jul 2006;20(7):1030-1035.
11. Earle D, Seymour N, Fellingner E, Perez A. Laparoscopic versus open incisional hernia repair: a single-institution analysis of hospital resource utilization for 884 consecutive cases. *Surg Endosc*. Jan 2006;20(1):71-75.
12. Goodney PP, Birkmeyer CM, Birkmeyer JD. Short-term outcomes of laparoscopic and open ventral hernia repair: a meta-analysis. *Arch Surg*. Oct 2002;137(10):1161-1165.
13. Bingener J, Buck L, Richards M, Michalek J, Schwesinger W, Sirinek K. Long-term outcomes in laparoscopic vs open ventral hernia repair. *Arch Surg*. Jun 2007;142(6):562-567.
14. Olmi S, Scaini A, Cesana GC, Erba L, Croce E. Laparoscopic versus open incisional hernia repair: an open randomized controlled study. *Surg Endosc*. Apr 2007;21(4):555-559.
15. Kurmann A, Visth E, Candinas D, Beldi G. Long-term Follow-up of Open and Laparoscopic Repair of Large Incisional Hernias. *World J Surg*. Feb 2011;35(2):297-301.
16. Heniford BT, Park A, Ramshaw BJ, Voeller G. Laparoscopic ventral and incisional hernia repair in 407 patients. *J Am Coll Surg*. Jun 2000;190(6):645-650.
17. Kirshtein B, Lantsberg L, Avinoach E, Bayme M, Mizrahi S. Laparoscopic repair of large incisional hernias. *Surg Endosc*. Dec 2002;16(12):1717-1719.
18. LeBlanc KA, Whitaker JM. Management of chronic postoperative pain following incisional hernia repair with Composix mesh: a report of two cases. *Hernia*. Dec 2002;6(4):194-197.
19. Parker HH, 3rd, Nottingham JM, Bynoe RP, Yost MJ. Laparoscopic repair of large incisional hernias. *Am Surg*. Jun 2002;68(6):530-533; discussion 533-534.
20. Rosen M, Brody F, Ponsky J, et al. Recurrence after laparoscopic ventral hernia repair. *Surg Endosc*. Jan 2003;17(1):123-128.
21. Novitsky YW, Porter JR, Rucho ZC, Getz SB, Pratt BL, Kercher KW, Heniford BT. Open preperitoneal retrofascial mesh repair for multiply recurrent ventral incisional hernias. *J Am Coll Surg*. Sep 2006;203(3):283-289.
22. Lindstrom D, Sadr Azodi O, Wladis A, et al. Effects of a perioperative smoking cessation intervention on postoperative complications: a randomized trial. *Ann Surg*. Nov 2008;248(5):739-745.



Carolinus HealthCare System

For more information go to www.cmc-surgery.org/CEQOL
or email: CeQOL@carolinashealthcare.org