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C A R O L I N A S  
**Hernia  
Handbook**  
(CHAPTER 1)

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# hernia

CHAPTER 1  
**Inguinal and Femoral Hernias**

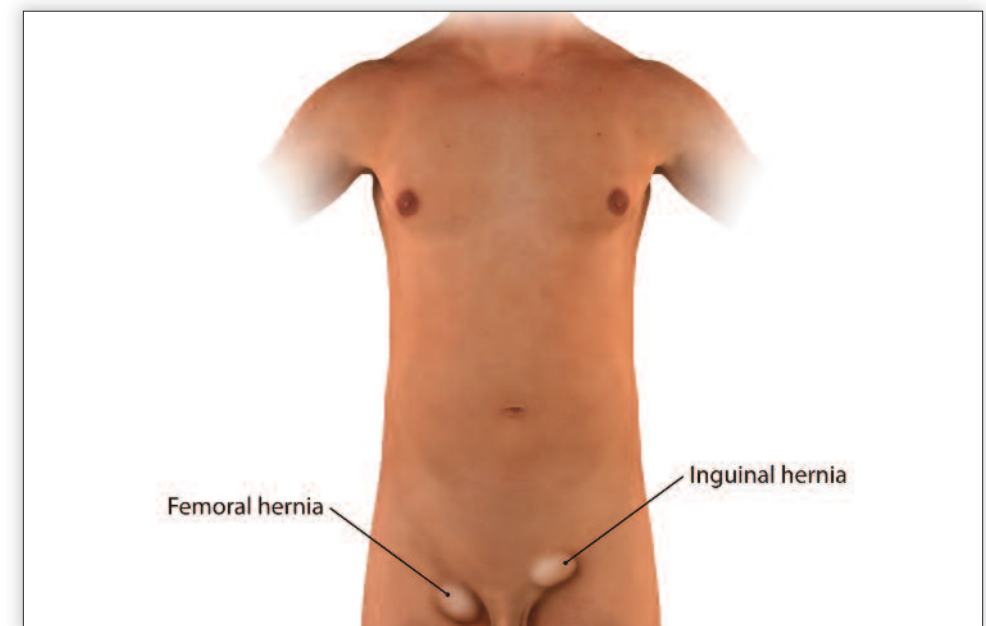
## Inguinal and Femoral Hernias

### 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%.<sup>1</sup> 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).<sup>2</sup>

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.

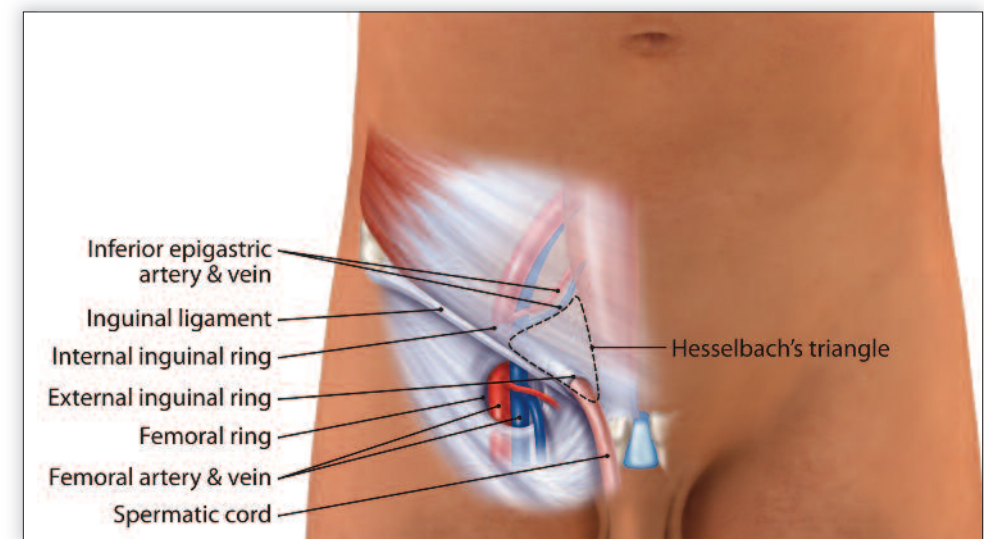
Usually inguinal hernias can be pushed back into the abdomen (this is called “reducing the hernia”), although they later slip back out. “Incarceration” is when intestines get trapped in the hernia and cannot be pushed back into the abdomen through the defect or hole in the abdominal wall. This can lead 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 year<sup>3</sup>, 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%.<sup>4</sup>

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.<sup>5,6</sup> 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.<sup>7</sup> 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.<sup>8</sup> One repair technique (the "Shouldice repair") has been reported to have a low recurrence rate<sup>9</sup>, but this low number has only been reported at one institution and has not been reproduced elsewhere.

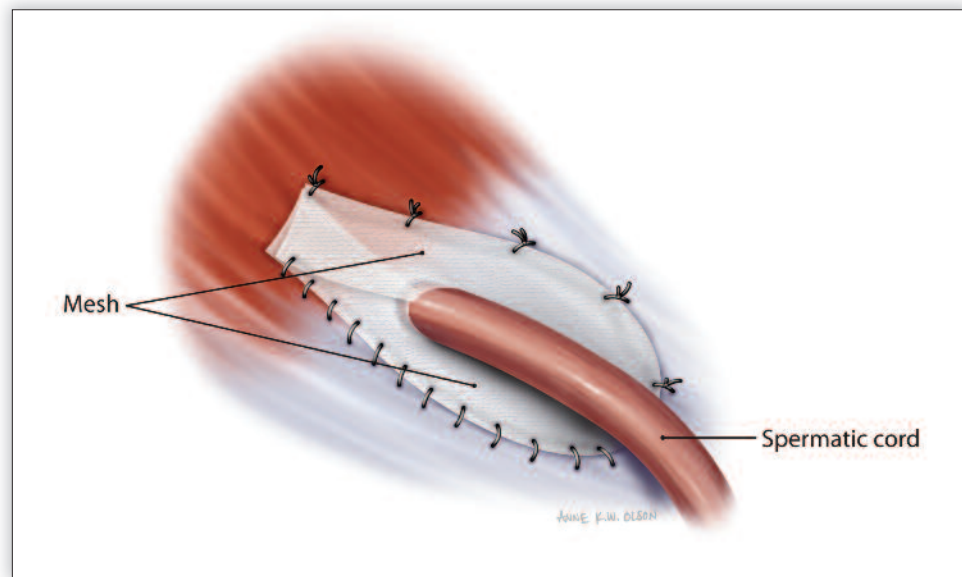
A "prosthetic" repair involves placement of mesh in order to close the hernia defect and reinforce the abdominal wall in the groin. It is the most common form of hernia repair in the modern world. Placing a mesh allows the surgeon to achieve a "tension-free" repair because the tissues do not have to 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.<sup>10</sup> However, there is no advantage of laparoscopic or open technique in the long term.<sup>5,6</sup>

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.<sup>11, 12</sup> However, the biggest risk factor for recurrence is a history of previous recurrence.<sup>11, 13</sup> 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.<sup>14-16</sup> 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.<sup>17-19</sup>

### **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.<sup>20, 21</sup> 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.<sup>22</sup>

### **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)<sup>23-25</sup>. 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.<sup>26</sup> 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.<sup>5, 6, 27</sup> 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.

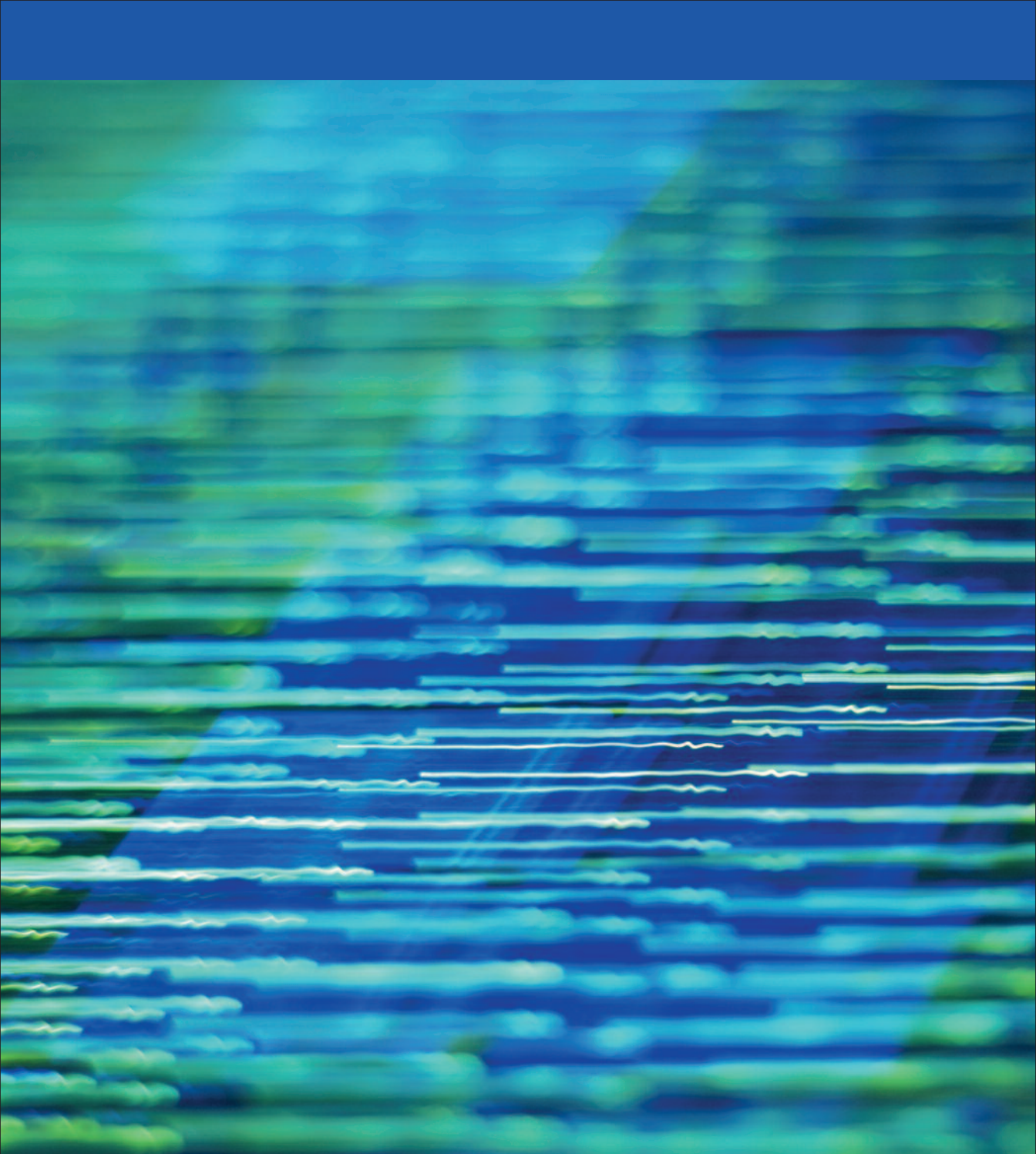
## SUMMARY

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.

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## Carolinus HealthCare System

For more information go to [www.cmc-surgery.org/CEQOL](http://www.cmc-surgery.org/CEQOL)  
or email: [CeQOL@carolinushealthcare.org](mailto:CeQOL@carolinushealthcare.org)