

Pediatric Hernia Inguinal and Femoral Repair



AMERICAN COLLEGE OF SURGEONS

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Patient Education

This educational information is to help you be better informed about your child's operation and empower you with the skills and knowledge needed to actively participate in your child's care.

Keeping You Informed

Information that will help you further understand the operation and your role in your child's recovery.

Education is provided on:

Hernia Repair Overview.....	1
Condition, Symptoms, Tests.....	2
Treatment Options.....	3
Risks and Possible Complications.....	4
Preparation and Expectations.....	5
Your Recovery and Discharge.....	6
Pain Control.....	7
Glossary/References.....	8

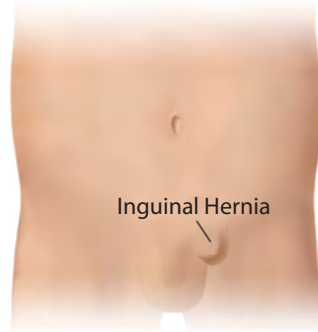
The Condition

A hernia occurs when tissue bulges out through an opening in the muscles. Any part of the abdominal wall can weaken and develop a hernia, but the most common sites are the groin (inguinal), the navel (umbilical), and a previous surgical incision site.

Common Symptoms

- Visible bulge in the scrotum or groin area, especially with coughing or straining
- Burning or pressure at the hernia site

Inguinal Hernia Location



Treatment Options

Surgical Procedure

Open hernia repair—An incision is made over the site and the hernia is repaired by suturing (sewing) the muscle closed.

Laparoscopic hernia repair—The hernia is repaired with instruments placed into small incisions in the abdomen.

Nonsurgical Procedure

An inguinal hernia will not go away on its own. Surgery is always recommended because of the high risk of the intestines getting caught in the hernia opening in young children.¹

Benefits and Risks of Your Child's Operation

Benefits—An operation is the only way to repair a hernia. Your child can return to normal activities in a short amount of time and, in most cases, will not have further discomfort.

Possible risks include—Return of the hernia; infection; injury to the bladder, blood vessels, intestines, or nerves; difficulty passing urine; continued pain and swelling of the testes or the groin area.

Risks of not having an operation—The hernia may cause pain and can increase in size. If the intestine becomes incarcerated (trapped) in the hernia pouch, there may be sudden pain, vomiting, and the need for an immediate operation. Strangulation may also cause reduced blood supply to the testes in boys and result in damage to the intestine.

Expectations

Before the operation—Evaluation may include blood work and urinalysis. Your child's surgeon and anesthesia provider will discuss their health history, home medications, and options for pain control.

The day of the operation—Your child will not eat or drink for several hours before the operation (amount of time may depend on your child's age). Check with the doctor's office to see if your child should take their routine medication. A parent can usually stay with the child in the waiting area and recovery room.

Your child's recovery—Your child may go home within 24 hours for small hernia procedures but may need to stay in the hospital longer for more complex repairs.

Call your Surgeon—If your child has severe pain, stomach cramping, chills, or a high fever (over 101°F or 38.3°C), odor or increased drainage from the incision, or no bowel movements for three days.

SURGICAL PATIENT EDUCATION PROGRAM

Prepare for the Best Recovery

This first page is an overview. For more detailed information, review the entire document.

The Condition, Symptoms, and Diagnostic Tests

Keeping You Informed

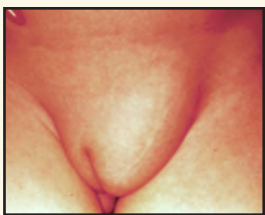
Recognizing Hernias in children

Inguinal hernias occur:

- In 5 of 100 full-term and 30 of 100 preterm infants
- 10 times more frequently in boys⁵
- More frequently on the right (75%), less often on the left (25%), or on both sides of the groin (15%)⁶

Incarceration can occur in about 10% of pediatric inguinal hernias and increases to 30% in premature infants. Incarceration may result in severe complications if not repaired.⁷

Other medical disorders that have symptoms similar to hernias include: enlarged lymph nodes, cysts, and testicular problems such as scrotal hydrocele.⁸

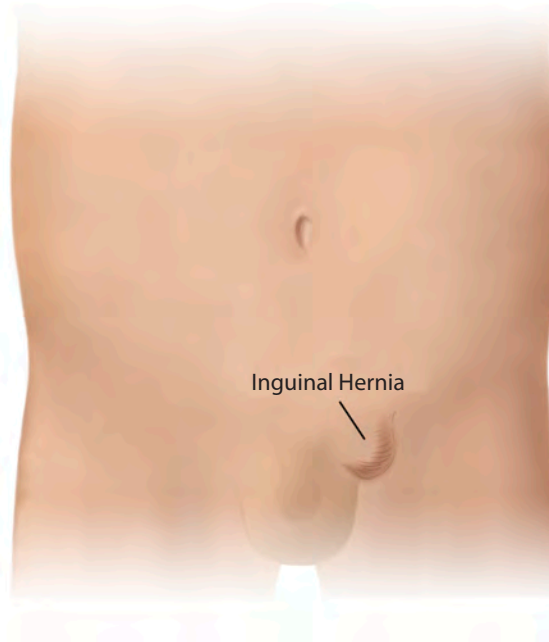


Front view of a girl with an Inguinal Hernia

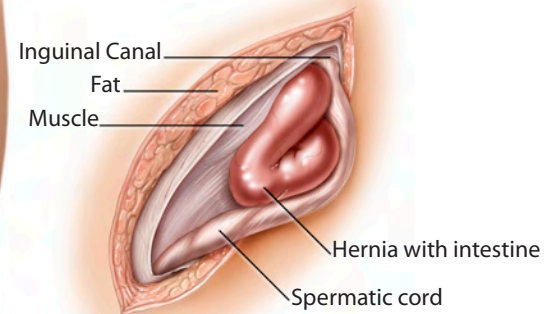


Front view of a boy with an Inguinal Hernia

Hernia Location



Inguinal Hernia



The Condition

The Hernia

An **inguinal hernia** occurs when part of the intestine bulges through a gap near the groin. A **reducible hernia** can be pushed back into the opening. When intestine or abdominal tissue fills the hernia sac and cannot be pushed back, it is called **irreducible** or **incarcerated**. A hernia is **strangulated** if the intestine is trapped in the hernia pouch, and the blood supply to the intestine is decreased. **This is a surgical emergency.**²

There are two types of **groin hernias**:

Inguinal hernias are the most common type of all hernias. They appear as a bulge in the groin or scrotum and are more common in boys.

A **Femoral hernia** appears as a bulge in the groin, upper thigh, or labia (skin folds surrounding the vaginal opening). A femoral hernia is more common in girls and is always repaired because of a high risk of strangulation.³

Symptoms

The most common symptoms are:

- A bulge in the groin usually seen with straining or crying.
- There may be discomfort at the hernia site.
- Sharp abdominal pain and vomiting can mean that the intestine has slipped through the hernia sac and is **strangulated**. **This is a surgical emergency and immediate treatment is needed.**⁴

Common Tests

History and Physical exam¹

The site is checked for a bulge.

Other tests may include (**see glossary**):

- Digital finger exam
- Blood tests
- Urinalysis
- Ultrasound if the hernia is difficult to see or feel¹

Inguinal Hernia



Closure of Muscle After Hernia Removal



Laparoscopic Single-Port Repair



Surgical Treatment

Inguinal hernia repair is performed in about 3 of 100 children and is the most common pediatric surgery.⁵ Repair of an inguinal hernia is always recommended in children. Premature infants are often operated on before leaving the neonatal intensive care unit (NICU) because the risk of the hernia becoming incarcerated is greatest in early infancy.⁹

The type of operation depends on hernia size and location, your child's health, age, anesthesia risk, and the surgeon's expertise. An operation is the only treatment for incarcerated/strangulated and femoral hernias.

Open Hernia Repair

The surgeon makes an incision above the hernia site, and the sac protruding through the gap in the muscles is repaired. An open repair can be done with local anesthesia. Pediatric repair is usually done as an open repair without mesh. If needed, orchidopexy (moving an undescended testicle down into the scrotum) will be done with the hernia repair.¹⁰

Laparoscopic Hernia Repair

The surgeon inserts small ports (hollow tubes) through punctures or small incisions in the abdomen. For children, the port is usually inserted through the umbilicus (belly button area). The abdomen is inflated with carbon dioxide gas to make it easier for the surgeon to see the internal organs. Surgical tools and a light are placed into the ports. The muscle at the hernia site is sutured together. The recurrence rate is the same as the open repair.¹¹ Single-port laparoscopic procedures using the umbilicus as the only access site are gaining popularity in both pediatric and adult surgery.¹²

Nonsurgical Treatment

Watchful waiting is not recommended because of the high risk of incarceration, especially in young infants.¹

Keeping You Informed

Open vs. Laparoscopic repair

The open suture (sewn) repair is done most often in young children. It is a short procedure and can be done with local anesthesia. Local anesthesia (pain and numbing medication) can be injected near the hernia site or provided in the back near the spine (caudal block or spinal anesthesia). Complications of the open approach are rare.¹³

The laparoscopic approach allows the surgeon to see the vas deferens and other important vessels easily, which may cause less trauma and injury and a quicker return to normal activity.⁵⁻¹⁴ The surgical incision size is reduced, and the other side of the groin can be inspected for a potential hernia.⁶ Laparoscopic repair usually requires general anesthesia and takes longer. Studies differ on the amount of pain and recurrence of the hernia in children when laparoscopy is compared with the open suture repair. A laparoscopic repair with mesh is not recommended until age 20 years due to a child's continued growth and possible trauma to the vas deferens, which may result in infertility.

Risks of this Procedure

RISKS	WHAT CAN HAPPEN	KEEPING YOU INFORMED
Long-term pain	Long-term groin pain following infant repair is rare. Groin pain was reported in 28 of 1,000 adults who had a hernia repair during childhood. ¹⁵	Pain is usually managed with acetaminophen or ibuprofen, and most children resume normal activity in a few days.
Recurrence (hernia comes back)	Pediatric inguinal hernia reoccurs with open repair in: 10 in 1,000 children who had a full term birth; 150 of 1,000 premature infant repairs and 200 of 1,000 repairs after incarceration. ⁶ Recurrence following laparoscopic repair is 20 of 1000.	The majority of hernias recur within 5 years of repair. ¹⁶ Laparoscopic repair is recommended for recurrent hernias because the surgeon avoids previous scar tissue. ¹⁰
Testicular atrophy (injury)	A strangulated or incarcerated hernia can result in a loss of blood supply to the testicles. This is reported as occurring on average in 30 per 1,000 cases and increases to 180 per 1,000 cases of emergency strangulation repairs. ¹	Testicular atrophy is reported only in cases of strangulation and incarceration. Unless the testes are necrotic, they should not be removed. ¹
Testicular or scrotal pain/swelling	Fluid may accumulate in the scrotal sac (Hydrocele) after 12 of 1,000 surgeries. ⁶	Scrotal swelling after pediatric inguinal hernia repair usually resolves on its own. ¹
Injury to the vas deferens	The vas deferens carries the sperm from the scrotal area to the penis. During hernia repair, it may be damaged. This may not be recognized until adulthood. It is reported to occur in less than 20 of 1,000 repairs. ¹	Injury to the vas deferens during hernia repair in childhood may be a reason for infertility in men. ¹ Rare cases of infertility caused by the use of mesh have also surfaced. ²
Infection	Pediatric wound infection is reported as 12 of 1,000 patients. ⁶	Routine antibiotics are typically not given for inguinal or femoral hernia repair.
Iatrogenic (related to surgery) undescended testicle	Failure to replace the testicles back in the scrotum during hernia repair occurs in less than 10 in 1,000. ¹	In males, the testicles move (descend) from the abdomen into the scrotum. In 40 of 1,000 full term infants and 300 of 1,000 premature infants the testicle remains in the abdomen. In about half of babies, the testicle descends into the scrotum by 6 months.
Injury to internal organs - bowel, bladder, blood vessels	Injury can be caused by instruments inserted with laparoscopic repair. Bowel/bladder injury is reported as 1 per 1,000 and blood vessel injury is less than 1 per 1,000. ¹⁴	For bladder injury, a Foley catheter remains in place to drain the urine until the bladder is healed. Rarely surgical repair is needed. For bowel injury, the bowel is repaired and/or a nasogastric tube is placed to keep the stomach empty. Any injury to a blood vessel is repaired.
Anesthesia	Most hernias are repaired on an outpatient basis. An overnight stay is usually indicated for full-term infants less than 3 months old. ¹⁶ Local (spinal) anesthesia may be used in premature infants less than 36 weeks old. ¹	Anesthesia complications are extremely rare. There is no difference in cardiac and respiratory problems between general and local anesthesia in premature infants. ¹ Children can expect to resume normal activity 48 hours after surgery. ¹⁶
Respiratory complications	Apnea (periods of not breathing) right after the operation is seen in 47 of 1,000 premature infants. ¹⁷ Premature infants with large hernia repairs need help breathing from a machine (mechanical ventilation) in 340 of 1,000 cases. ¹⁸	Apnea is associated with premature infants who had a history of apnea and other medical problems prior to hernia repair. ¹⁷ When large hernia contents are placed back in the abdomen of a premature infant, abdominal pressure on the lungs causes difficulty breathing. ¹⁸
Heart/cardiac complications	There are no reports of heart complications related specifically to a hernia operation.	Other health problems increase the risk for heart and anesthesia related complications. Your anesthesia provider will suggest the best anesthesia option for your child.
Death	No deaths are reported directly related to pediatric inguinal and femoral hernia repair.	The risks of complications and possible death are greater with strangulated and incarcerated hernia repairs. ¹

**The data has been averaged per 1,000 cases*

Expectations: Preparing for Your Child's Operation



Preparing for Your Child's Operation

Home Medication

Bring a list of any medications and vitamins that your child is taking. Some medications may have to be adjusted before the operation and can affect your child's recovery and response to anesthesia.

Anesthesia

Let your anesthesia provider know if your child has allergies, neurologic disease (epilepsy), heart disease, stomach problems, lung disease (asthma), endocrine disease (diabetes, thyroid conditions), or loose teeth.

If your child is having local anesthesia they will usually go home the same day. They may need to stay longer if they have had laparoscopic surgery with general anesthesia, a larger hernia with mesh repair, an incarcerated hernia, nausea, or vomiting. All hospitals allow a parent to stay the night in a room with their child.

The Day of Your Operation

Follow these guidelines or those provided by your surgeon for when your child should stop eating or drinking.¹⁹

Type:	Limit:
Light meal: Toast, cereal, soup	6 hrs
Infant formula or milk products	6 hrs
Breast milk, orange juice	4 hrs
Clear liquids: Water, fruit juice without pulp, clear tea or carbonated beverages	2 hrs

- They should bathe or shower and clean their abdomen with mild antibacterial soap.
- They should brush their teeth and rinse their mouth with mouthwash.
- Do not shave the surgical site; the surgical team will clip the hair near the incision if necessary.

What to Bring

- Insurance card and identification
- List of medicines
- Loose-fitting, comfortable clothes
- Slip-on shoes that don't require your child to bend over
- Favorite toy or book for recovery period

What You Can Expect

Safety Checks

An identification (ID) bracelet and allergy bracelet with your child's name and hospital/clinic number will be placed on their wrist. These should be checked by all health team members before providing any procedures or giving your child medication. The surgeon will mark and initial the operation site if an operation on only one side is planned.

Fluids and Anesthesia

An intravenous line (IV) will be started to give your child fluids and medication. This is usually inserted after your child is asleep in the operating room.

General anesthesia is most often used and your child will be asleep and pain free for this surgery.¹ A tube will be placed down your child's throat to help your child breathe during the operation. For spinal anesthesia, a small needle with medication will be placed in their back alongside the spinal column. They will be awake but pain free.

After the Operation

Your child will be moved to a recovery room where their heart rate, breathing rate, oxygen saturation, and blood pressure will be closely watched. Be sure all visitors wash their hands.

Preventing Pneumonia and Blood Clots

Movement and deep breathing after the operation can help prevent postoperative complications such as blood clots, fluid in the lungs, and pneumonia.

Questions to Ask

About my child's operation:

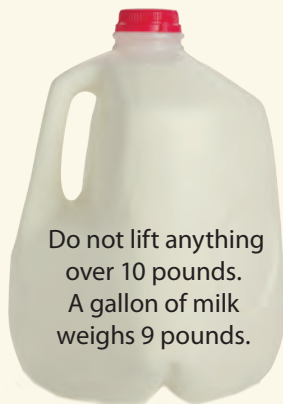
- What are the side effects and risks of anesthesia?
- What technique will be used to repair the hernia (laparoscopic or open; Steri-strips, glue, or sutures)?
- What are the risks of this procedure for my child?
- Will you be performing the entire operation yourself?
- What level of pain should I expect my child to have and how will it be managed?
- How long will it be before my child can return to normal activities (school, play, sports)?

Recovery and Discharge

Keeping You Informed

High-Fiber Foods

Foods high in fiber include beans, bran cereals and whole-grain breads, peas, dried fruit (figs, apricots, and dates), raspberries, blackberries, strawberries, sweet corn, broccoli, baked potatoes with skin, plums, pears, apples, greens, and nuts



Do not lift anything over 10 pounds. A gallon of milk weighs 9 pounds.

Thinking Clearly

If general anesthesia is given, it is not unusual for some children to feel upset and confused as anesthesia is wearing off. Your child may need more sleep than usual the first day home, and allowing them to wake naturally should help.

Nutrition

When your child wakes up from the anesthesia, they will be able to drink small amounts of liquid. If they do not feel sick, they can return to their regular diet.

Activity

- Your child will slowly increase their activity. They should get up and walk every hour or so to prevent breathing problems, pneumonia, and constipation.
- There is no lifting, climbing, or strenuous physical activity for several weeks following surgical repair of an inguinal hernia.
- Children can usually return to normal activities within a few days.¹⁹

Return to School

After recovery, your child should be able to return to school or day care in 2 to 3 days.

Wound Care

- **Always wash your hands** before and after touching near the incision site.
- Your child may have Steri-strips over the incision site. These will fall off in 7 to 10 days. There may be a clear dressing over the Steri-strips which can usually be removed after 48 hours.
- Your child may shower or bathe after 2 days but avoid prolonged soaking.
- A small amount of drainage from the incision is normal. If the dressing is soaked with blood, call your surgeon.



Handwashing



Steri-strips

- Do not allow your child to wear tight or rough clothing. It may rub against the incisions and make it harder for them to heal.
- Protect the new skin, especially from the sun. The sun can burn and cause darker scarring.
- The incision will heal in about 4 to 6 weeks and will become softer and continue to fade over the next year.

Bowel Movements

Avoid straining with bowel movements. Increasing the fiber in your child's diet with high-fiber foods and drinking 8 to 10 glasses of fluid daily can help keep stools soft.

Pain

Most children have little to no pain after the repair of an inguinal hernia. Children's acetaminophen (Tylenol), ibuprofen, or Tylenol with hydrocodone (Lortab elixir) can be used to relieve pain, with most children needing only 1 to 2 doses. Throat lozenges or popsicles for sore throat pain or dryness from the tube placed in the throat during anesthesia can also help.

When to Contact Your Child's Surgeon

Contact your child's surgeon if your child has:

- Pain that will not go away
- Pain that gets worse
- A fever of more than 101°F or 38.3°C
- Vomiting
- Swelling, redness, bleeding, or bad-smelling drainage from the wound site
- Strong or continuous abdominal pain or swelling of the abdomen
- No bowel movement 2 to 3 days after the operation

Pain Control

Everyone reacts to pain in a different way. A pain scale will be used to measure your child's pain. Extreme pain puts extra stress on the body at a time when the body needs to focus on healing.

Non-Narcotic Pain Medication

Most non-opioid analgesics are classified as non-steroidal anti-inflammatory drugs (NSAIDs). They are used to treat mild pain and inflammation or combined with narcotics to treat severe pain. Possible side effects of NSAIDs are stomach upset, bleeding in the digestive tract, and fluid retention. These side effects usually are not seen with short-term use. Let your doctor know if your child has allergies, diabetes, or any other conditions that might interact with pain medication.

Pain Control without Medicine

- **Distraction** will help your child focus on other activities instead of their pain. Reading to your child, playing quiet games, or other engaging activities can help them cope with mild pain and anxiety.
- **Imagery** will help your child think of other pleasant thoughts may also distract them from the pain or discomfort. Ask your child to close their eyes and imagine a beautiful place or feeling they have seen or experienced.



OTHER INSTRUCTIONS:

FOLLOW-UP APPOINTMENTS

WHO:

DATE:

PHONE:

Glossary of Terms and More Information

For more information, please go to the American College of Surgeons Patient Education website at <http://www.facs.org/patienteducation>.
For a complete review of hernia repair, consult *Selected Readings in General Surgery*, "Hernia" 2012 Vol. 37 No. 8 at www.facs.org/SRGS.

GLOSSARY

Abdominal X ray: Checks for any loops of bowel or air-filled sacs.

Abdominal Ultrasound: Sound waves are used to determine the location of deep structures in the body. A hand roller is placed on top of clear gel and rolled across the abdomen.

Blood tests: Tests may include a chemistry profile (sodium, potassium, chloride, carbon dioxide, blood urea nitrogen and creatinine) and complete blood count (red blood cell and white blood cell count).

Computerized tomography (CT) scan: A diagnostic test using X ray and a computer to create a detailed, three-dimensional picture of your abdomen or other area of the body.

General anesthesia: A treatment with certain medicines that puts you into a deep sleep so you do not feel pain during surgery.

Incarceration: The inability to reduce (push back) a protrusion of an organ or the fascia of an organ through the wall of the cavity that normally contains it.

Local anesthesia: The loss of sensation only in the area of the body where an anesthetic drug is applied or injected.

Nasogastric tube: A soft plastic tube inserted in the nose and down to the stomach; used to empty the stomach of contents and gases, to rest the bowel.

Seroma: A collection of serous (clear/yellow) fluid.

Strangulation: Part of the intestine or fat is squeezed in the hernia sac, and blood supply to the tissue is cut off.

Urinalysis: A visual and chemical examination of the urine most often used to screen for urinary tract infections and kidney disease.

REFERENCES

The information provided in this report is chosen from recent articles based on relevant clinical research or trends. The research below does not represent all that is available for your child's surgery. Ask your doctor if he or she recommends that you read any additional research.

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DISCLAIMER

This information is published to educate you about your specific surgical procedures. It is not intended to take the place of a discussion with a qualified surgeon who is familiar with your situation. It is important to remember that each individual is different, and the reasons and outcomes of any operation depend upon the patient's individual condition.

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