

Ventral Hernia Repair



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Patient Education

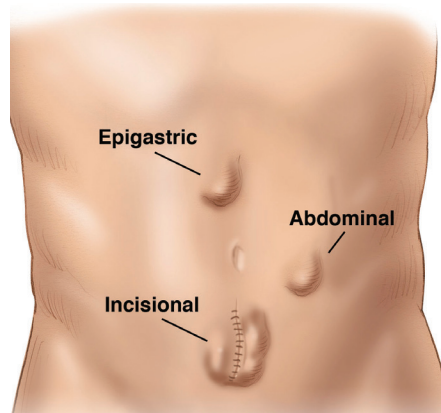
This educational information is to help you be better informed about your operation and empower you with the skills and knowledge needed to actively participate in your care.

Keeping You Informed

Information that will help you further understand your operation and your role in healing.

Education is provided on:

Hernia Repair Overview.....	1
Condition, Symptoms, Tests.....	2
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Common Sites for Ventral Hernia

The Condition

A ventral hernia is a bulge through an opening in the muscles on the abdomen. The hernia can occur at a past incision site (incisional), above the navel (epigastric), or other weak muscle sites (primary abdominal).

Common Symptoms

- Visible bulge on the abdomen, especially with coughing or straining
- Pain or pressure at the hernia site

Treatment Options

Surgical Procedure

Open hernia repair—An incision is made near the site, and the hernia is repaired with mesh or by suturing (sewing) the muscle closed.

Laparoscopic hernia repair—The hernia is repaired by mesh or sutures inserted through instruments placed into small incisions in the abdomen.

Nonsurgical Procedure

Watchful waiting is an option for adults with hernias that are reducible and not uncomfortable.¹⁻³

Benefits and Risks of Your Operation

Benefits—An operation is the only way to repair a hernia. You can return to your normal activities and, in most cases, will not have further discomfort.

Risks of not having an operation—The size of your hernia and the pain it causes can increase. If your intestine becomes trapped in the hernia pouch, you will have sudden pain and vomiting and require an immediate operation.

If you decide to have the operation, possible risks include return of the hernia; infection; injury to the bladder, blood vessels, or intestines; and continued pain at the hernia site.

Expectations

Before your operation—Evaluation may include blood work, urinalysis, ultrasound, or a CT scan. Your surgeon and anesthesia provider will review your health history, home medications, and pain control options.

The day of your operation—You will not eat or drink for 6 hours before the operation. Most often, you will take your home medication with a sip of water. You will need someone to drive you home.

Your recovery—You may go home within 24 hours for small hernia procedures but may need to stay in the hospital longer for more complex repairs. The average length of stay for patients with a complex hernia repair is 1.5 days.¹

Call your surgeon if you have severe pain, stomach cramping, chills with a high fever (higher than 101°F), odor or increased drainage from your incision, or no bowel movement for 3 days.

SURGICAL PATIENT EDUCATION PROGRAM

Prepare for the Best Recovery

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

Keeping You Informed

Abdominal Wall Hernias

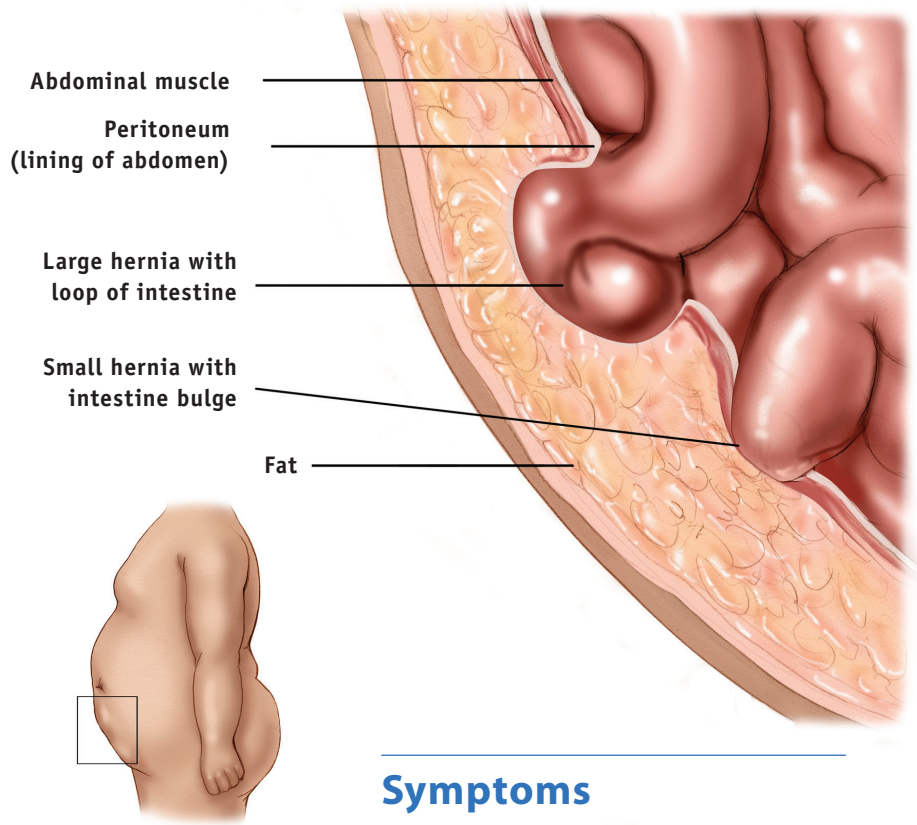
They are also called ventral hernias. They can occur:

- At birth (congenital)
- Over time due to muscle weakness
- At a past incision site

Incisional Hernias²⁻⁴

Incisional hernias can develop at the laparoscopic port site in 5 of 1,000 patients and in up to 150 of 1,000 patients who have had a prior open abdominal incision. Most appear in the first 5 years after an operation. Risk factors that can contribute to incisional hernia formation include:

- Obesity, which creates tension and pressure on abdominal muscles
- Large abdominal incisions
- Postoperative infection (note that smoking is related to higher infection rates)
- Weakness of the connective tissue (the material between the cells of the body that gives it strength, sometimes called the cellular glue)
- Diabetes mellitus
- Pulmonary disease



The Condition

The Hernia

A **ventral hernia** is a bulge through an opening in the muscles on the abdomen. If the hernia reduces in size when a person is lying flat or in response to manual pressure, it is **reducible**. If it cannot be reduced, it is **irreducible or incarcerated**, and a portion of the intestine may be bulging through the hernia sac. 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

A **primary abdominal hernia** occurs spontaneously at an area of natural weakness of the abdominal muscle.

An **incisional hernia** bulges through a past incision site. This issue can be the result of scar tissue or weak muscles around the site.

An **epigastric hernia** bulges midline above the umbilicus.

Symptoms

The most common symptoms of a hernia are:

- Visible bulge in the abdominal wall, especially with coughing or straining
- Hernia site pain or pressure

Sharp abdominal pain and vomiting may mean that the intestine has slipped through the hernia sac and is strangulated.

This is a surgical emergency and immediate treatment is needed.

Common Tests

History and Physical

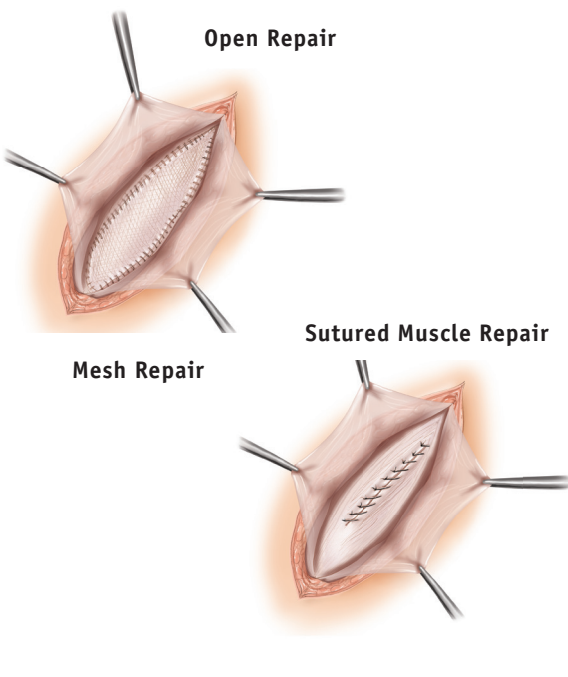
The site is checked for a bulge.

Additional Tests (see Glossary)

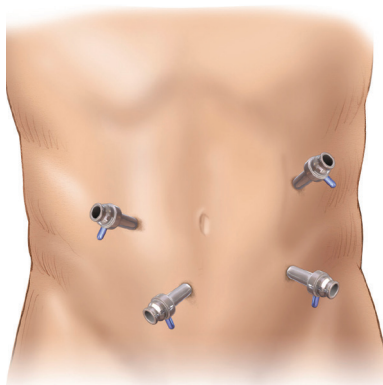
Other tests may include:

- Ultrasound
- Computerized tomography (CT) scan
- Blood tests
- Urinalysis
- Electrocardiogram (ECG)—for patients over 45 or if high risk of heart problems

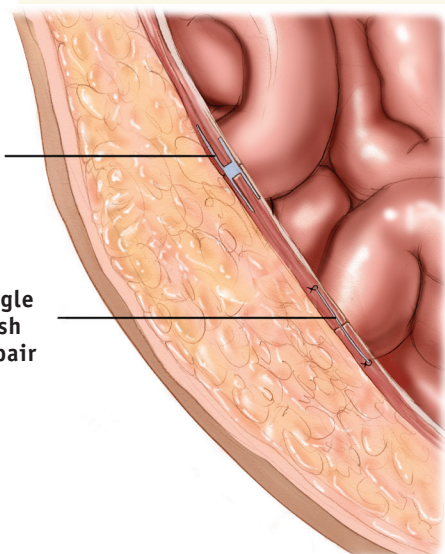
Surgical and Nonsurgical Treatment



Laparoscopic Repair



Double Mesh Repair



Single Mesh Repair

Surgical Treatment

The type of operation depends on the hernia size, location, and if it is a repeat hernia. Your health, age, anesthesia risk, and the surgeon's expertise are also important. An operation is the only treatment for a hernia repair.

Open Hernia Repair

The surgeon makes an incision near the hernia site. The bulging tissue is gently pushed back into the abdomen. Sutures, mesh, or a tissue flap is used to close the muscle. With complex or large hernias, small drains may be placed going from inside to the outside of the abdomen. The site is closed using sutures, staples, or surgical glue.

Open Mesh Repair

The hernia sac is removed. Mesh is placed over the hernia site. The mesh is attached using sutures sewn into the stronger tissue surrounding the hernia site. Mesh is often used for large hernia repairs and may reduce the risk that the hernia will come back. The site is closed using sutures, staples, or surgical glue.

Laparoscopic Hernia Repair

The surgeon will make several small punctures or incisions in the abdomen. Ports or trocars (hollow tubes) are inserted into the openings. Surgical tools are placed into the ports. The abdomen is inflated with carbon dioxide gas to make it easier for the surgeon to see the hernia. Mesh is sutured, stapled, or clipped to the muscle around the hernia site. The hernia site can also be sewn directly together.

Nonsurgical Treatment

Watchful waiting is an option for a hernia without symptoms. All patients should get treatment if they have sudden sharp abdominal pain and vomiting. These symptoms can indicate an incarcerated hernia and bowel obstruction.

Trusses or belts made to apply pressure on a hernia require correct fitting. When used correctly, part or complete control of the hernia was achieved in 31% of patients, and 64% found the truss to be uncomfortable.⁵

Keeping You Informed

Open versus Laparoscopic Incisional Repair

There is no one type of repair that is good for all ventral hernias. Laparoscopic repairs are associated with lower infection rates and shorter hospital stays. There is no difference in recurrence rates, long-term pain, or quality of life. For patients with strangulated intestines and infections, the laparoscopic approach may not be an option.^{1,6,7}

Will My Hernia Come Back?

Mesh reduces the risk that the hernia will return again.⁸ Mesh can be tacked, stapled, or sutured.

Obesity and wound complications increase the risk of recurrence.⁹ You may be placed on a weight loss, smoking cessation, or a diabetes control program before an elective repair to support the best outcome.

Risk of this Procedure

SAMPLE

Risks from Outcomes Reported in the Last 10 Years of Literature	Percentage	Keeping You Informed
Urinary retention: Inability to urinate after the urinary catheter is removed	21%	General anesthesia, older age, prostate problems, and diabetes may be associated with urinary retention. A temporary catheter or medication may be used to treat retention.
Seroma: A collection of serous (clear/yellow) fluid	12%	A seroma usually goes away on its own within 4 to 6 weeks. Rarely, the fluid is removed with a sterile needle. ¹⁰
Recurrence: A hernia can recur up to several years after repair	Open 12% Laparoscopic 10% Non-Mesh 17% ¹¹	Recurrence rates are higher for complex or infected hernia repair or for repairs done without mesh. In a 5-year follow-up, 6% to 20% of patients with mesh repair experienced serious complications, including bowel obstruction, fistulas, or tunneling wounds. ¹²
Intestines/bowel injury	Open Less than 1% Laparoscopic 4.3% ¹³	Injury will be repaired at the time of operation. If there is bowel leakage into the abdominal cavity, the hernia repair will be done after the bowel heals. A nasogastric (NG) tube will be placed to keep the stomach empty until fluid is moving through the bowel.
Risks Based on the ACS Risk Calculator in June 2017*	Percentage	Keeping You Informed
Wound infection: Infection at the area of the incision or near the organ where surgery was performed	Open 3.9% Laparoscopic Less than 1%	Antibiotics and drainage of the wound may be needed. Smoking can increase the risk of infection.
Return to surgery: The need to go back to the operating room due to a problem after the prior surgery	Open 2.5% Laparoscopic Less than 1%	Significant pain and bleeding may cause a return to surgery. Your surgical and anesthesia team is prepared to reduce all risks of return to surgery.
Pneumonia: Infection in the lungs	Open: 1.2% Laparoscopic Less than 1%	Stopping smoking, movement and deep breathing after your operation can help prevent respiratory infections.
Urinary tract infection: Infection of the bladder or kidneys	Open 1.2% Laparoscopic Less than 1%	Drinking fluids and catheter care decrease the risk of bladder infection.
Blood clot: A clot in the legs that can travel to the lung	Open 1.1% Laparoscopic Less than 1%	Longer surgery and bed rest increase the risk. Getting up, walking 5 to 6 times per day, and wearing support stockings reduce the risk.
Heart complication: Includes heart attack or sudden stopping of the heart	Less than 1%	Problems with your heart or lungs can be aggravated by general anesthesia. Your anesthesia provider will take your history and suggest the best option for you.
Renal (kidney) failure: Kidneys no longer function in making urine and/or cleaning the blood of toxins	Less than 1%	Preexisting renal conditions; fluid imbalance, Type 1 diabetes; over age 65; antibiotics; and other medications may increase the risk.
Death	Less than 1%	
Any complication, including: Surgical infections, breathing difficulties, blood clots, renal (kidney) complications, cardiac complications, and return to the operating room	Open 9.7% Laparoscopic 2.9%	Complications related to general anesthesia and surgery may be higher in smokers, elderly and obese patients, and those with high blood pressure and breathing problems. Wound healing may also be decreased in smokers and those with diabetes and immune system disorders.

***The ACS Surgical Risk Calculator estimates the risk of an unfavorable outcome. Data is from a large number of patients who had a surgical procedure similar to this one. If you are healthy with no health problems, your risks may be below average.**

If you smoke, are obese, or have other health conditions, then your risk may be higher. This information is not intended to replace the advice of a doctor or health care provider. To check your risks, go to the ACS Risk Calculator at

<http://riskcalculator.facs.org>.

Expectations: Preparing for Your Operation

What You Can Expect

Home Medication

Bring a list of all of the medications, vitamins, and any over-the-counter medicines that you are taking. Your medications may have to be adjusted before your operation. Some medications can affect your recovery and response to anesthesia. Most often you will take your morning medication with a sip of water.

Anesthesia

Let your anesthesia provider know if you have allergies, neurologic disease (epilepsy, stroke), heart disease, stomach problems, lung disease (asthma, emphysema), endocrine disease (diabetes, thyroid conditions), or loose teeth; use alcohol or drugs; take any herbs or vitamins; or if you have a history of nausea and vomiting with anesthesia.

If you smoke, you should let your surgical team know, and you should plan to quit. Quitting before your surgery can decrease your rate of respiratory and wound complications and increase your chances of staying smoke-free for life. Resources to help you quit may be found at www.facs.org/patienteducation or www.lungusa.org/stop-smoking.

Length of Stay

If you have local anesthesia, you will usually go home the same day. You may stay overnight if you have a repair of a large or incarcerated hernia. A laparoscopic repair may result in a longer anesthesia time. Complications such as severe nausea and vomiting or an inability to pass urine may also result in a longer stay.

Safety Checks

An identification (ID) bracelet and allergy bracelet with your name and hospital/clinic number will be placed on your wrist. These should be checked by all health team members before they perform any procedures or give you medication. Your surgeon will mark and initial the operation site.

Fluids and Anesthesia

An intravenous line (IV) will be started to give you fluids and medication. For general anesthesia, you will be asleep and pain free during the operation. A tube may be placed down your throat to help you breathe during the operation. For spinal anesthesia, a small needle with medication will be placed in your back alongside your spinal column. You will be awake during the operation but pain-free.

The Day of Your Operation

- You should not eat or drink for at least 6 hours before the operation.
- You should bathe or shower and clean your abdomen with a mild antibacterial soap.
- You should brush your teeth and rinse your mouth with mouthwash.
- Do not shave the surgical site; the surgical team will clip the hair near the incision site.
- Let the surgical team know if you are not feeling well or if there have been any changes in your health since last seeing your surgeon.

What to Bring

- Insurance card and identification
- Advance directives (see glossary)
- List of medicines
- Loose-fitting, comfortable clothes
- Slip-on shoes that don't require that you bend over

After Your Operation

You will be moved to a recovery room where your heart rate, breathing rate, oxygen saturation, blood pressure, and urine output will be closely watched. Be sure that all visitors wash their hands.

Preventing Pneumonia and Blood Clots

Movement and deep breathing after your operation can help prevent postoperative complications such as blood clots, fluid in your lungs, and pneumonia. Every hour, take 5 to 10 deep breaths and hold each breath for 3 to 5 seconds.

When you have an operation, you are at risk of getting blood clots because of not moving during anesthesia. The longer and more complicated your surgery, the greater the risk. This risk is decreased by getting up and walking 5 to 6 times per day, wearing special support stockings or compression boots on your legs, and for high-risk patients, taking a medication that thins your blood.

Questions to Ask

About my operation:

- What are the side effects and risks of anesthesia?
- What technique will be used to repair the hernia (laparoscopic or open; mesh or with sutures)?
- What are the risks of this procedure for me?
- Will you be performing the entire operation yourself?
- What level of pain should I expect and how will it be managed?
- How long will it be before I can return to my normal activities (work, driving, lifting)?
- May I have my hernia repaired during a gastric bypass surgery?

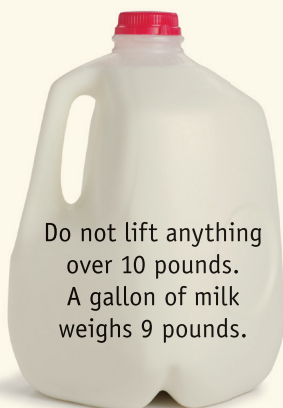
Your Recovery and Discharge

SAMPLE

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.

Your Recovery and Discharge

Thinking Clearly

If general anesthesia is given or if you need to take narcotics for pain, it may cause you to feel different for 2 or 3 days, have difficulty with memory, or feel more fatigued. You should not drive, drink alcohol, or make any big decisions for at least 2 days.

Nutrition

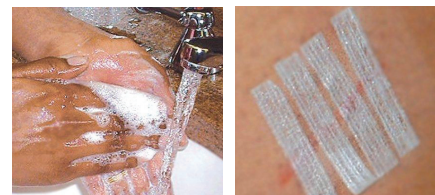
- When you wake up from the anesthesia, you will be able to drink small amounts of liquid. If you do not feel sick, you can begin eating regular foods.
- Continue to drink about 8 to 10 glasses of water each day.
- Eat a high-fiber diet so you don't strain while having a bowel movement.

Activity

- Slowly increase your activity. Be sure to get up and walk every hour or so to prevent blood clot formation.
- You may go home the same day for a simple repair. If you have other health conditions or complications such as nausea, vomiting, bleeding, or infection after surgery, you may stay longer.
- Do not lift items heavier than 10 pounds or participate in strenuous activity for at least 6 weeks.

Work and Return to School

- After recovery, you can usually return to work or school within 2 to 3 days.
- You will not be able to lift anything over 10 pounds, climb, or do strenuous activity for 4 to 6 weeks following surgical repair of a ventral hernia.
- Lifting limitation may last for 6 months for complex or recurrent repairs.²



Handwashing

Steri-Strips®

Wound Care

- Always wash your hands before and after touching near your incision site.
- Do not soak in a bathtub until your stitches, Steri-Strips®, or staples are removed. You may take a shower after the second postoperative day unless you are told not to.
- Follow your surgeon's instructions on when to change your bandages.
- A small amount of drainage from the incision is normal. If the dressing is soaked with blood, call your surgeon.
- If you have Steri-Strips in place, they will fall off in 7 to 10 days.
- If you have a glue-like covering over the incision, let the glue to flake off on its own.
- Avoid wearing tight or rough clothing. It may rub your 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.
- Your scar 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 by increasing the fiber in your diet with high-fiber foods or over-the-counter medicines (like Metamucil® and FiberCon®). Be sure you are drinking 8 to 10 glasses of water each day.

Pain

The amount of pain is different for each person. The new medicine you will need after your operation is for pain control, and your doctor will advise how much you should take. You can use throat lozenges if you have sore throat pain from the tube placed in your throat during your anesthesia.

When to Contact Your Surgeon

Contact your surgeon if you have:

- Pain that will not go away
- Pain that gets worse
- A fever of more than 101°F (38.3°C)
- Repeated vomiting
- Swelling, redness, bleeding, or foul-smelling drainage from your wound site
- Strong or continuous abdominal pain or swelling of your abdomen
- No bowel movement by 3 days after the operation

Pain Control

Everyone reacts to pain in a different way. A scale from 0 to 10 is used to measure pain. At a “0,” you do not feel any pain. A “10” is the worst pain you have ever felt. Following a laparoscopic procedure, pain is sometimes felt in the shoulder. This is due to the gas inserted into your abdomen during the procedure. Moving and walking help to decrease the gas and the shoulder pain.

Extreme pain puts extra stress on your body at a time when your body needs to focus on healing. Do not wait until your pain has reached a “10” or is unbearable before telling your provider. It is much easier to control pain before it becomes severe.

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 you have heart, kidney, or liver problems. Examples of NSAIDs include ibuprofen, Motrin®, Aleve®, and Toradol® (given as a shot).

Narcotic (Opioid) Pain Medication

Narcotics or opioids are used for severe pain. Possible side effects of narcotics are sleepiness, lowered blood pressure, heart rate, and breathing rate; skin rash and itching; constipation; nausea; and difficulty urinating. Some examples of narcotics include morphine, oxycodone (Percocet®/Percodan®), and hydromorphone (Dilaudid®). Medications can be given to control many of the side effects of narcotics.

Pain Control without Medication

Distraction helps you focus on other activities instead of your pain. Listening to music, playing games, or other engaging activities can help you cope with mild pain and anxiety.

Splinting your stomach by placing a pillow over your abdomen with firm pressure before coughing or movement can help reduce the pain.

Guided imagery helps you direct and control your emotions. Close your eyes and gently inhale and exhale. Picture yourself in the center of somewhere beautiful. Feel the beauty surrounding you and your emotions coming back to your control. You should feel calmer.

OTHER INSTRUCTIONS:

FOLLOW-UP APPOINTMENTS

WHO:

DATE:

PHONE:

Keeping You Informed

Pain after Ventral Hernia Repair

There was no difference in long-term pain or quality of life scores when comparing laparoscopic with open procedures. Pain that continued for more than 6 months is reported as 30 of 1,000 patients having laparoscopic procedures and 20 of 1,000 for open procedures. The cause of long-term pain will be assessed by your surgeon and is sometimes treated with local analgesia injections.⁸



Guided imagery



Splinting Your Stomach

For more information, please go to the American College of Surgeons Patient Education website at facs.org/patienteducation.
For a complete review of hernia repair, consult *Selected Readings in General Surgery*, "Hernia" 2015 Vol. 41 No. 7 at facs.org/SRGS.

GLOSSARY

Advance directives: Documents signed by a competent person giving direction to health care providers about treatment choices.

Blood tests: Tests usually include a Chem-6 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.

Electrocardiogram (ECG): Measures the rate and regularity of heartbeats, the size of the heart chambers, and any damage to the heart.

Fistula: An abnormal connection between two hollow spaces, such as blood vessels, intestines, or other hollow organs.

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

Hematoma: A localized collection of blood in the tissue or organ.

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.

Tunneling wounds: Wounds that have channels or tracts that extend from a wound into deeper layers of skin, muscle or fat.

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.

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 surgery. Ask your doctor if he or she recommends that you read any additional research.

1. Kurian A, Gallagher S, Cheeyandira A, et al. Predictors of in-hospital length of stay after laparoscopic ventral hernia repair: Results of multivariate logistic regression analysis. *Surg Endosc*. 2010 Nov;24(11):2789-2792. doi: 10.1007/s00464-010-1048-4. Epub 2010 Apr 24.
2. Malangoni MA, Rosen MD, Hernias. In CM Townsend, RD Beauchamp et al. *Textbook of Surgery*. Philadelphia, PA: Saunders, 2008.
3. Helgstrand F, Rosenberg J, Bisgaard T. Trocar site hernia after laparoscopic surgery: A qualitative systematic review. *Hernia*. 2011;15:113-121.
4. Yahchouchy-Chouillard E, Aura T, Picone O et al. Incisional hernia related risk factors. *Digestive Surgery*. 2003;20:3-9.
5. Cheek CM, Williams MH, Farndon JR. Trusses in the management of hernia today. *British Journal of Surgery*. 1995;82:1611-1613.
6. Forbes SS, Eskicioglu C, McLeod RS et al. Meta-analysis of randomized controlled trials comparing open and laparoscopic ventral and incisional hernia repair with mesh. *British Journal of Surgery*. 2009;96:851-858.
7. Hwang CS, Wichterman KA, Alfrey EJ. Laparoscopic ventral hernia repair is safer than open repair: Analysis of the NSQIP data. *Journal of Surgical Research*. 2009;156:213-216.
8. Brill JB, Turner PL. Long-term outcomes with transfascial sutures versus tacks in laparoscopic ventral hernia repair: A review. *The American Surgeon*. 2011;77:458-465.
9. Sauerland S, Korenkov M, Kleinen T, et al. Obesity is a risk factor for recurrence after incisional hernia repair. *Hernia*. 2004 Feb;8(1):42-46. Epub 2003 Sep 6.
10. Turner PL, Park AE. Laparoscopic repair of ventral incisional hernias: Pros and cons. *Surgical Clinical of North America*. 2008;88:85-100.
11. Kokotovic D, Bisgaard T, Helgstrand F. Long-term Recurrence and Complications Associated With Elective Incisional Hernia Repair. *JAMA*. 2016 Oct 18;316(15):1575-1582. doi: 10.1001/jama.2016.15217.
12. Burger JW, Luijendijk RW, Hop WC, et al. Long-term follow-up of a randomized controlled trial of suture versus mesh repair of incisional hernia. *Ann Surg*. 2004 Oct;240(4):578-83.
13. Zhang Y, Zhou H, Chai Y, et al. Laparoscopic versus Open Incisional and Ventral Hernia Repair: A Systematic Review and Meta-analysis. *World J Surg*. 2014 Sep;38(9):2233-2240. doi: 10.1007/s00268-014-2578-z.

DISCLAIMER

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