UW Medicine
UNIVERSITY OF WASHINGTON MEDICAL CENTER

Modified Ravitch Procedure for Pectus Excavatum

What to expect before, during, and after surgery

This handout is for patients who are having a modified Ravitch procedure to repair a condition called pectus excavatum.

What is pectus excavatum?

The *pectus* is the chest wall. It is made of the breastbone (*sternum*), ribs, cartilage, and muscles. These structures protect the heart, lungs, and other vital body parts from injury.

Pectus excavatum is a deformity of the chest wall. The term is Latin for "hollowed chest." It is also called sunken chest, because the chest caves inward. Doctors believe it is caused by an overgrowth of the rib cartilage that is connected to the sternum.

Your procedure will be done in the Surgery Pavilion at University of Washington Medical Center.

What are the symptoms?

Symptoms of this condition can include:

- Pain
- Breathing problems
- Limits in physical activity because of lower lung capacity or pressure on the heart

There may also be emotional and social effects because of the physical deformity.

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How is it diagnosed?

Your thoracic surgeon will give you a full physical exam. You may also have these tests:

- *Electrocardiogram* (ECG): This exam measures the electrical signals that control heart rhythm.
- Imaging tests of your chest: An X-ray or a *computed tomography* (CT) scan, or both, are used to find the *Haller index*, a measurement that tells your doctor how severe your deformity is.
- *Echocardiogram*: This test uses sound waves to take pictures of the hearts.
- *Pulmonary function testing*: A group of tests that show how well your lungs work.
- Blood tests

The results of these tests will tell your doctor if surgery is a good option for you.

What will surgery do?

The main goal of pectus excavatum surgery is to improve breathing, heart function, and physical appearance. During your surgery, your doctor will remove some of the deformed cartilage and reposition your breastbone.

Thoracic surgeons at the University of Washington Medical Center (UWMC) are experienced in using the *modified Ravitch procedure* to correct pectus excavatum.

What happens during the procedure?

The modified Ravitch procedure is done in the operating room. You will be given *general anesthesia*, which means you will be asleep during the procedure. Your surgeon will:

- Make an incision across your chest
- Remove the ends of the ribs where they attach to the sternum
- Cut the sternum bone and move it to a better position
- Remove cartilage, if needed
- Use stitches to hold the bone and cartilage in place
- Use surgical wires to tie a titanium bar behind your ribs and sternum to support your chest in its new position

The bar will stay in place for at least 2 years. When it is time, you can have another procedure to remove the bar.

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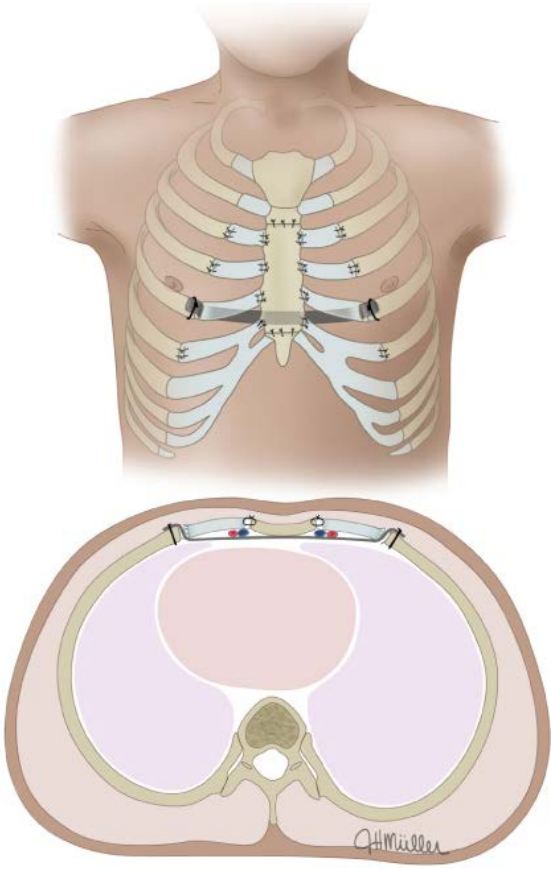

In a modified Ravitch procedure, a titanium bar is placed in the front of your chest to hold your ribs and sternum in a better position.

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Can other people see the titanium bar?

The titanium bar is placed behind your ribs. Other people cannot see it when they look at you.

Who is on my healthcare team?

You will meet members of your care team while you are in the hospital. You will meet some of them before surgery, and some of them after surgery. Your healthcare team may include:

- Your attending thoracic surgeon
- An *anesthesiologist*, the doctor who will manage your pain during and after surgery
- Surgical residents and fellows, a group of doctors who will help your surgeon in your care
- Nurses, who will provide care and teaching, and will help with discharge planning
- Physician assistants
- *Pulmonary* (lung) doctor
- Dietitian
- Pharmacist
- Social worker
- Physical therapist
- Respiratory therapist

How do I prepare for surgery?

- Most patients stay in the hospital 3 to 5 days after this surgery. Make plans with someone who will take care of your home, family, and pets for at least that length of time.

Starting 48 Hours (2 Days) Before

- Do **not** shave any part of your body, even parts that you normally shave.

The Evening Before

- Eat your evening meal as usual.
- Do **not** drink anything that contains alcohol.
- After midnight, do **not** eat or drink anything. You may take small sips of water with prescribed medicines, as needed. Follow the instructions you received from your pre-anesthesia nurse.

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Day of Surgery

At Home

- Do **not** eat or drink anything. If you must take prescription medicines, take them with **only** small sips of water.

At the Hospital

- We will ask you to sign a consent form if you have not already signed one. This form tells us that you give us your permission to do the procedure.
- We will cover you with a heating blanket while you wait to go into the operating room. This keeps your body warm and helps prevent infection. Ask for a heating blanket if you do not receive one.
- An anesthesia provider will give you medicine to make you sleep.
- We will place a breathing tube through your mouth into your *trachea* (windpipe). A machine (*ventilator*) will breathe for you through this tube during your surgery.
- We will insert a catheter (tube) into the *epidural space* in your spine. This allows us to give you pain medicine after surgery.
- We will insert a Foley catheter into your bladder during surgery. This is a tube to drain urine from your bladder when you cannot leave your bed. We will remove the catheter after you move to the inpatient unit and you can get out of bed with help.

What to Expect After Surgery

When you awaken after surgery:

- You will have 1 or 2 thin, flexible tubes coming out of your skin near the incision site. These tubes drain excess fluid that gathers in your chest after surgery. We will remove them when the drainage has decreased.
- You will have *sequential compression devices* (SCDs) on your legs. These leg wraps inflate and deflate from time to time to help move the blood from your legs back to your heart. SCDs help prevent blood clots in your legs while you are not moving around very much.
- You may feel groggy or thirsty. We will let you drink fluids once you are fully awake. We will let you eat when your nurse is sure you can swallow safely.
- You may have a sore throat from the breathing tube. This will go away in a few days.

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Pain Control

It is important to have good pain control after surgery. Keeping your pain under control helps you relax and heal. You and your healthcare team will work together to manage your pain.

There are many ways to control pain. A team of doctors and nurses who specialize in managing pain may be involved in your care. This team is called the Acute Pain Service.

You may receive pain medicine using a medical device, such as:

- A *patient controlled analgesia* pump (PCA) that delivers pain medicine through an *intravenous* (IV) line. With a PCA, you control when to take your next dose of pain medicine.
- An *epidural catheter*. With an epidural, the pain medicine is given continuously. The epidural provides pain control to your chest cavity. You can walk and your arms will work as usual while you have the epidural.

Be sure to tell your healthcare team about your level of pain. We will ask you to rate your pain on a scale of 1 to 10, with 1 being little or no pain, and 10 being the worst pain you can imagine. For best pain control, also tell us when you notice that the pain medicine is wearing off. We want to give you your next dose before your pain gets too strong.

Telling us about your level of pain helps us track your progress and make sure you are getting the right amount of pain medicine. Knowing how your medicines are working also helps us create your plan for pain control when you leave the hospital.

Discharge Pain Medicines

Before discharge, you will be started on pain medicines you can take by mouth. These will most likely be a combination of an opioid and acetaminophen or ibuprofen, or both.

Many people are concerned about becoming addicted to prescription pain medicines. This should not be a problem if you use the medicines exactly as prescribed, and stop using them when your pain level is no longer high.

Coughing and Deep-Breathing Exercises

One reason to keep your pain under control after surgery is so that you can cough and breathe deeply. This clears mucus and fluids from your lungs and helps prevent *pneumonia* (lung infection). When you are in pain, it is very hard to cough and breathe as deeply as you need to. Your nurses will ask you often about your pain when you are doing the coughing and deep breathing exercises.

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The respiratory therapist and your nurses will show you how to use an incentive spirometer and an Acapella device to help clear your lungs. The goal is to repeat these exercises 10 times every hour. It is OK to switch between the 2 devices.

Activities in the Hospital

With good pain control, you should be able to sit in a chair for your meals and walk in the hall with help soon after surgery. Your nurses will help you to increase your activities to include bathing, dressing, and walking by yourself. Movement is important to help prevent pneumonia. You will not be able to use your arms as usual while your sternum is healing. We will tell you how long you need to avoid lifting, pushing, or pulling anything that weighs more than 10 pounds (a gallon of water weighs almost 9 pounds).

Sleeping

It is common for sleep patterns to change after surgery. You may find that you:

- Sleep more than usual
- Have trouble falling asleep
- Wake up during the night
- Have nightmares or intense dreams

Sleep changes are likely caused by anesthesia, the pain medicines you are taking, and being in a different setting than usual. Once you return home, catch up on your sleep, and return to your normal routines, your sleep patterns should return to normal.

Nutrition

It is common to have a lower appetite after this surgery, but your body needs more calories than usual for healing. We suggest that you eat foods that taste good to you in small meals throughout the day. You should also choose foods that are high in protein and healthy fats, since these nutrients are the building blocks our bodies use most for healing.

Going Home

Your healthcare team will assess your needs after surgery. Your team will help you and your family prepare so that your recovery at home goes smoothly.

Medicines

A pharmacist or nurse will review all your medicines before discharge and will give you a written schedule of when to take them. Your instructions will say to take your pain medicines "as needed." Take them before your pain gets too strong.

Activities After Discharge

- You cannot drive while you are taking prescription pain medicine (opioids). These medicines can make you sleepy and affect your reaction time, so driving is not safe.
- Your healthcare team will teach you how to protect your sternum. You will be on *sternal precautions* for several months to give your ribs time to heal. This means that during this time, you must:
  - Avoid lifting anything that weighs more than 15 pounds
  - Avoid athletic activities and heavy exercise

  Your doctor will tell you how long you need to be on these precautions. You will also talk about how you are healing and how long you need to follow your precautions at each follow-up clinic visit.
- We encourage you to walk and to slowly increase your time being active, without using your arms and upper body.
- Most patients may resume mild non-contact sport activities like brisk walking and jogging within a few months after surgery. It will take longer before you can return to sports that use your arms such as swimming, tennis, and weight lifting.

Incision Care

- Check your incision every day for any changes. Call your doctor if you see increased redness, tenderness, swelling, or drainage, or if the incision opens.
- Do **not** use any ointments, creams, or lotions on your incisions. Incisions heal best when they are left open to the air. If needed, use dry gauze to cover your incisions.

When to Call

Call your surgeon's office or call 206.598.6190 and ask for the thoracic surgical resident on call to be paged if you have:

- Severe pain at your incision that is sudden, new, or not eased by your pain medicine
- Any new drainage from your incision or opening of the incision

- Any feeling of sudden or recurrent cracking, popping, or instability of your chest wall
- Fever higher than 100.5°F (38°C) or chills
- Increased tiredness, shortness of breath, or fatigue that is not relieved with rest
- Nausea, vomiting, or other issues that last more than 24 hours that don't allow you to take your medicines

Follow-up Visits

- You will receive the date and time of your follow-up visit at your surgeon's office 1 to 2 weeks after your surgery.
- You may also need to follow up 1 year and 2 years after surgery.
- Two years after surgery, talk with your surgeon about removing the titanium bar. Removing the bar means having a second, less invasive outpatient surgery. It does not take very long to recover from this second surgery.

Questions?

Your questions are important. Call your doctor or healthcare provider if you have questions or concerns.

Weekdays from 8 a.m. to 5 p.m., call the Thoracic Surgery Clinic at 206.598.4477 and press 8 to talk with a nurse.

After hours and on holidays and weekends, call 206.598.6190 and ask for the Thoracic Surgeon on call to be paged.

Published PFES: 09/2017
Clinician Review: 09/2017
Reprints on Health Online: https://healthonline.washington.edu

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