

Pectus Excavatum: Frequently Asked Questions

Contents

What is pectus excavatum?.....	- 1 -
What causes pectus excavatum?.....	- 2 -
Is it common for one side of the chest to look different than the other?	- 2 -
Will my pectus excavatum get worse over time?	- 4 -
Does it affect my heart and lungs?	- 6 -
What is the plan for evaluating and treating pectus excavatum?.....	- 6 -
How do you decide who needs surgery?	- 7 -
Do I have to have surgery to 'fix' it?	- 8 -
What are the surgical options?.....	- 10 -

What is pectus excavatum?

A person whose chest sinks down or inward in the front has a condition called “**pectus excavatum**” (Figure 1).

In typical chest anatomy, the chest is made up of the spine in the back where the bony ribs attach, then come around and connect to the costal cartilages in the front. The cartilages then connect to the breastbone (also known as the sternum) and together, these structures are called your “**chest wall**” (Figure 2).

Figure 1:

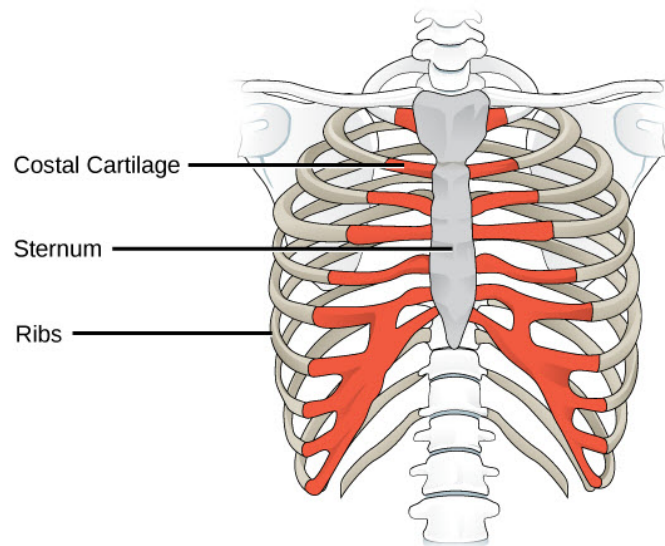
Photo of a patient with pectus excavatum



European Journal of Pediatric Surgery Reports. 06. e18-e22.
10.1055/s-0038-1623537. [CC BY 2.0](#)

Figure 2:

The chest wall showing ribs, costal cartilage, the sternum, and spine in the back.



CNX OpenStax, CC BY 4.0, via Wikimedia Commons

What causes pectus excavatum?

Although we don't know exactly what causes pectus excavatum, it is thought that the cartilages grow differently or unusually and this pushes the sternum inward, creating the sunken look. Some people also have abnormal curvatures of the spine (like scoliosis) that we can also discuss if present.

Some people with pectus excavatum may also have certain connective tissue diagnoses (like "Marfan's Syndrome") and may need further evaluation including genetic testing or testing of their heart.

Is it common for one side of the chest to look different than the other?

Yes, it is very common for one side of the chest to be more, or less sunken than the other. No one's chest is completely equal, even in people without pectus

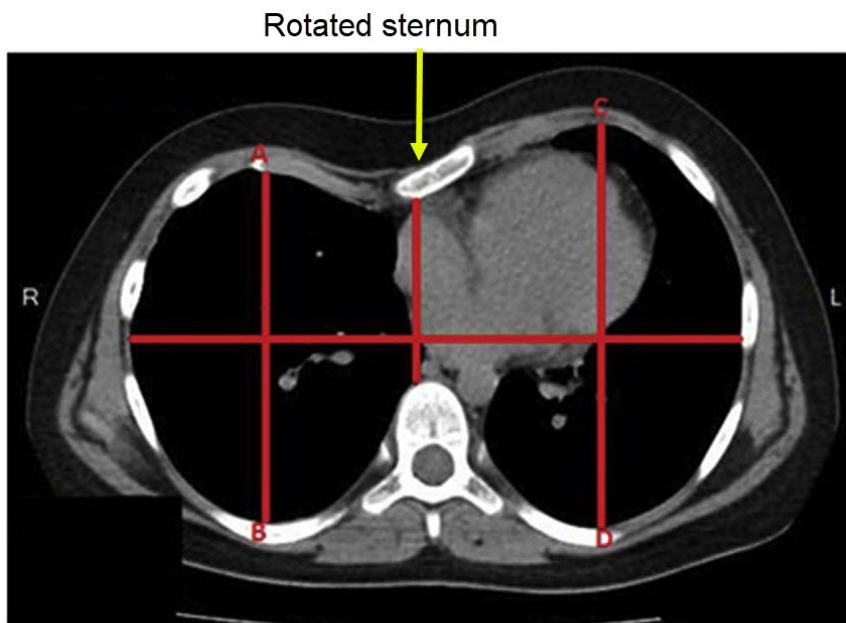
excavatum. And no pectus excavatum is the same as the next, which is why we practice individualized care.

Although having a more unequal chest makes it harder to completely “fix” it with surgery, we will try our best to make your chest as equal as possible. We take time to understand your concerns to make sure that your expectations are understood and met to the best of our ability before surgery.

The sternum plays a big part in the shape of the pectus excavatum. It may be flat making the chest appear more even (symmetric) **or** the sternum may be rotated to one side (Figure 3). When the sternum is rotated, the chest can appear uneven so one side may look more sunken, and the other side may stick out more (asymmetric).

Figure 3:

CT scan of the chest showing the sunken in chest and a rotated sternum of a patient with pectus excavatum.



Evaluation of thoracic vertebrae rotation in patients with pectus excavatum - Scientific Figure on ResearchGate.

Often the lower part of the ribs can appear to stick out (rib or costal flaring), and sometimes it appears more on one side than the other (see figure 4). If this is a concern you have, you should talk to your surgeon about this before surgery. It is normal for the look of your chest not to be perfectly equal after surgery and the rib flaring may not improve or can become more noticeable. However, this often improves over time and can be addressed later if it's bothersome.

Figure 4

In this photo you can see the **rib flaring** on the right side of the photo. The ribs appear to be sticking out.



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Will my pectus excavatum get worse over time?

Pectus excavatum can be noticed at birth or early in life in some children. However, the chest may sink in more as someone goes through growth spurts during puberty. Although it is not common, some patients notice an improvement in their chest appearance as their muscles develop more around the area during puberty.

What symptoms do patients with pectus excavatum have?

Many patients do not have symptoms, while others may have:

- Breathing problems

- Difficulty with exercise
- Chest pain
- Tiredness
- A rapid heartbeat
- Wheezing or coughing

It is difficult to know if these symptoms are caused because your chest is sunken, and these symptoms may still be there after surgery. However, for people who do have symptoms, they often say they ‘feel better’ after surgery. We will run more tests if we think it is necessary and continue to follow you over time after surgery.



While some people may not care about the look of their chest, others struggle with body image concerns that can interfere with life. They may avoid taking off their shirt in public (like when swimming) or adjust the way they dress or hold themselves so other people cannot tell their chest is sunken.

It is very common for people with pectus excavatum to have posture problems which can include forward slouching shoulders, a curved forward upper spine (kyphosis) and a stomach that sticks out. This posture can make the chest look worse than it is. Physical therapy can often help with your posture and at times, we have you meet with them even before surgery.



Additionally, some people have trouble with fitting of supportive wear, such as a bra. Symptoms are different for every patient. Importantly, there is no need for athletic restrictions and there are people with pectus who have become elite athletes (like Olympic Swimmer Cody Miller!) even without surgery.

Does it affect my heart and lungs?

Most people have no problems with their heart and lungs with normal, and even competitive, activities. However, there are some people with a *severe* pectus excavatum with heart and lungs concerns. This is rare and can be investigated if needed.



For some people, when they exercise really hard, they will feel the need to stop. The exact cause of this symptom is unclear; however, though rare, it might have to do with pressure on the heart. In some people this will get better after surgery.

What is the plan for evaluating and treating pectus excavatum?

Most people only need a two-view chest x-ray to calculate a **Haller Index** which is a number to tell us how severe the pectus excavatum is (explained in the next section). Importantly, having a “severe” Haller Index does not mean you will have bad symptoms. Some people with a “mild” Haller Index may even have “worse” symptoms; again, it’s dependent upon the individual.

In special circumstances, some people may get:

- A chest CT scan
- An EKG
- An ultrasound of the heart (aka: *echocardiogram*)
- Tests of lung function

These are often unnecessary and may not affect the decision for surgery. Also, in our practice, we take photos including 3D surface scanning to help us follow your progress over time.

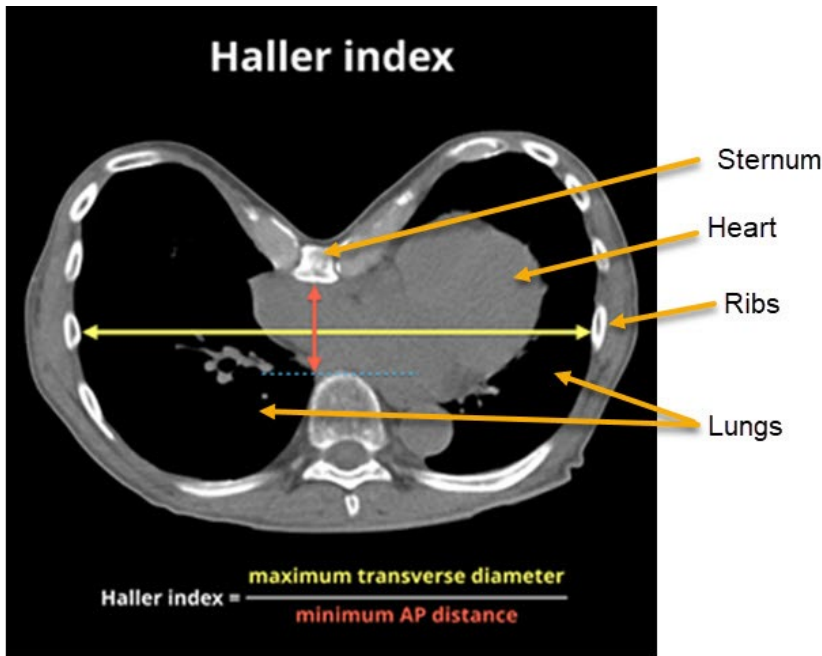
How do you decide who needs surgery?

1. First, we figure out how severe a person's pectus is by calculating a Haller Index (see **Figure 4** of a CT scan on the next page, but note we often calculate this with only a chest x-ray). A **Haller Index** is a measurement of how wide the chest is compared to the deepest part of the sunken chest. The higher the number, the more "severe" the pectus excavatum. The severity may not correlate with symptoms and is only one part that helps guide our decision-making process. Corrective surgery is considered when a Haller index is greater than or equal to 3.25.

Haller Index ranges:

- **Normal chest:** Less than 2.0
- **Mild excavatum:** 2.0 - 3.2
- **Moderate excavatum:** 3.2 - 3.5
- **Severe excavatum:** Greater than 3.5

Figure 4: CT scan of the chest of a patient with a symmetric pectus excavatum demonstrating how to calculate the Haller Index.



Case courtesy of Assoc Prof Frank Gaillard, Radiopaedia.org, rID: 57436

2. Some people have the symptoms listed above on page 4, while others may have concerns about body image, both of which may lead to a discussion about surgery.
3. Your surgeon will talk about the specific details of your chest and how surgery may help with some concerns. Not all areas of your chest can be fixed with surgery and it's very important for us to understand your concerns so that we can decide if surgery will help.
 - Importantly, the decision to have surgery is a shared decision between you, your family, and your surgeon.

Do I have to have surgery to 'fix' it?

Not necessarily. In some cases, there are only a few 'medical' reasons to have an operation. Some people have a mild pectus (Haller Index less than 2.5) or they

do not have symptoms and chose not to have surgery.

The first clinic visit is often informational. Patients and families usually take time to think about it after their first visit and set up another visit to talk about it more. There is no rush in deciding about surgery.



There is one non-surgical option you can consider called the **vacuum bell**. It is currently under study, and we have not offered it here at Mott. It requires extended suction to be applied to the chest and while it does avoid surgery if effective, is a more extended therapy. It is only suggested to improve mild pectus excavatum so not all patients are good candidates.

There is no medical treatment to make it go away, however, it normally doesn't worsen once you stop growing. Exercises to improve posture are very important even if you do not have surgery. We often recommend patients see a physical therapist to help with this.

Recommended Exercise Videos:

- How to Fix Your Posture in 4 Moves!
<https://youtu.be/g-7ZWPCWv0U>
- Corrective Exercise for Forward Head Posture and Upper Crossed Syndrome
<https://youtu.be/JA3O0NVb-sk>
- How to Fix Anterior Pelvic Tilt (SIT HAPPENS!)
<https://youtu.be/K-CrEi0ymMg>
- How to Correct Your Posture - 5 Home Exercises to Fix Your Posture
<https://youtu.be/5R54QoUbbow>

Additionally, we recommend you consider using a **breathing resistance trainer**. These can help you overcome anxiety and work through any sports or activity limitations you may have felt, even if you choose not to have surgery. Also, for people who do have surgery, it can help with recovery afterwards. Two options are listed below:

- The Expand-A-Lung® inspiratory/expiratory breathing resistance trainer: <https://expand-a-lung.com/>
- POWERbreathe breathing trainer: <https://www.powerbreathe.com/>

What are the surgical options?

Your surgeon will explain the options at your first clinic visit and recommend, based on your anatomy and other concerns, which procedure they believe is best for you. The procedures are also summarized below.

- **Nuss Procedure**

The Nuss Procedure is what is called a **minimally invasive** surgery. This is where we access the inside of your chest by making incisions in your skin on the outer side of your chest on both sides. We specially fit your pectus bar to your chest during surgery. A **pectus bar** is placed between your ribs and under your sternum, instantly pushing your sternum forward (it's kind of like putting braces on your teeth and then they're straight right away). This is done using a camera to watch from the inside. To prevent your chest from sinking back in while you continue to grow, we leave the bar in place for about 3 years.

- **Modified Ravitch Procedure**

During the Ravitch Procedure we make an incision on the front of the chest and remove the abnormal costal cartilages from where they attach to the sternum and the bony ribs. When the sternum is freed, a small bar is inserted underneath. As compared to the Nuss, we often leave a *shorter* bar in place for about *3-6 months* while the cartilage regrows to prevent your

chest from sinking back in. This procedure is sometimes chosen when someone has a more severe pectus excavatum, when the breastbone is very rotated, or with severe lower rib flaring. However, others chose this procedure if they do not want to leave the Nuss bar in place for 3 years.

- **Hybrid Approach**

As mentioned, we individualize our care to each person, their anatomy, and their specific concerns. Depending on each of these factors, we can figure out exactly how best to do the surgery and sometimes combine parts of the Ravitch with the Nuss procedure. For example, since we know rib flaring may not get better or may even get worse after a Nuss procedure, we may need to change our approach for some patients.

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