Pectus Excavatum (sunken chest, funnel chest)

Patient and family information, brought to you by the Education Committee of APSA

Overview - "What is it?"

Pectus excavatum is a condition where the bones of the chest did not develop as they should. The chest cage is made up of the center breastbone (sternum) in the front, the ribs (made of bone and cartilage, with the cartilage connecting the ribs to the breastbone), and the spine in the back. In pectus excavatum, the breastbone appears sunken or hollowed out (Figure 1). Sometimes the ribs are also malformed and do not appear even.

Pectus excavatum means hollowed chest and occurs in 1 in 400 births. Sometimes the child may have been born with a pectus and may get worse with age. Some think that the cartilaginous ribs grow unevenly, pushing down the breastbone. Some patients with problems of the bones and cartilage (Marfan's syndrome) can have a higher risk of pectus excavatum.

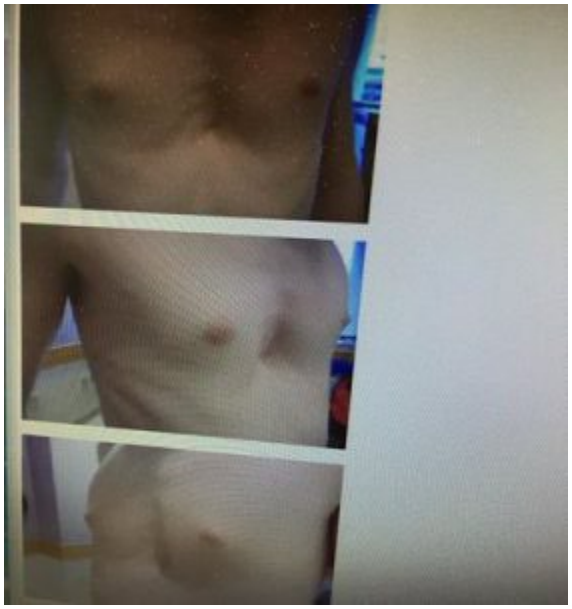

Figure 1: Pectus excavatum.

Picture courtesy of MJArca 12/2016

Signs and Symptoms - "What symptoms will my child have?"

Early symptoms: A hollow appearance of the breastbone, asymmetry of the ribs and the lower edges of the ribs.

Late symptoms: Worsening deformity. Occasionally, the patient may have problems breathing during exertion, overall breathing difficulty or heart issues.

Diagnosis - "What tests are done to find out what my child has?"

Computed tomography (CT) of chest: Detailed pictures of the chest are taken, reconstructed in different views to get a better picture of the chest. This shows the doctor how bad the pectus is—mild, moderate, or severe.

Echocardiography: Ultrasound of the heart to look at flows and function. This is not done routinely but may be ordered if there is concern about heart function.

Lung function tests: Testing how strong the lungs are. Again, not all patients need this; your doctor will decide whether your child requires this study.

Treatment - "What will be done to make my child better?"

Even with moderate or severe pectus, if it is not limiting the patient's quality of life, surgery does not need to be done.

Medical management: There is no medicine that can make pectus excavatum better. However, if the pectus excavatum is mild, exercises can make the chest muscles stronger. Being more conscious of having a good posture is also very helpful.

Surgery: For moderate or severe pectus with symptoms, surgery may be considered. Surgery is usually delayed until middle teenager years. This can be done using two approaches.

> **Nuss Procedure:** A steel bar is used to push out the breastbone. The bar stays in the chest for two to three years. (See Figure 2)

Figure 2. Chest X-ray after Nuss procedure.
Picture courtesy of MJArca, 12/2016.

Ravitch Procedure: The cartilaginous ribs are removed from their connection to the breastbone. The breastbone may have to be fractured before it can be straightened out and a strut may be placed as the breastbone heals.

Preoperative preparation: The child is asked to shower or bathe the night before or the morning of surgery. He or she should not eat anything solid for at least eight hours before surgery.

Postoperative care: The child is admitted to the hospital for several days. Pain control is achieved using epidural anesthesia, patient-controlled analgesia (PCA), nerve cryoablation, oral pain medications

Epidural: A long thin catheter is placed in the spine around the spinal cord. Pain medications are injected through this route, which the patient may also be able to control with a button.

PCA: Patient controls when pain medication is given. A syringe of pain medication is connected to the patient's IV. Based on the patient's weight, a safe dose of narcotic is given each time patient pushes a button.

Nerve cryoablation: This method is available in certain centers where the nerves by the ribs are frozen. There is numbness in the area around where the incisions and the bar are located. This method is currently only available for the Nuss Procedure.

Pain medications can be given by mouth or through the vein. These may include acetaminophen (Tylenol®), ketorolac or ibuprofen, as well as narcotics.

Activity: Gradual activity is directed by the surgical, nursing, and physical therapy teams.

In a Ravitch procedure, drains to collect fluid after surgery will be removed before discharge.

Risks: Bleeding, infection, pain. If the patient has Nuss procedure, the bar can get dislodged.

Benefits: The chest wall is straightened out.

Informed consent: A consent form is a legal document that states the tests, treatments or procedures that your child may need and the doctor or practitioner that will perform them. Before surgery, your doctor should tell you what the operation is, the goal of the surgery and other possible treatment options that are available. Your doctor should explain the risks and benefits of the surgery. You give your permission when you sign the consent form. You can have someone sign this form for you if you are not able to sign it. You have the right to understand your child's medical care in words you know. Before you sign the consent form, make sure all your questions are answered. It is important to know that during surgery, there are things that can happen that your doctor may have not predicted before going in. He or she will explain these to you after the surgery.

Home Care - "What do I need to do once my child goes home?"

Diet: Most patients are able to eat a general diet.

Activity: Ask your surgeon for specific recommendations. It is generally recommended to limit activity, especially those that twist the body or use the arm significantly (golf, tennis, swimming), for at least six months after surgery. Vigorous activity may dislodge the bar, and the patient would need another operation.

Wound care: The patient can shower in three days but may want to wait seven days after surgery before soaking the wound. If drains are still present, do not wet the drains.

Medicines: Medication for pain such as acetaminophen (Tylenol®) or ibuprofen (Motrin® or Advil®) or something stronger like a narcotic may be needed to help with pain for a few days after surgery. Stool softeners and laxatives are needed to help regular stooling after surgery, especially if narcotics are still needed for pain. Constipation is a very common problem after this surgery.

What to call the doctor for: Problems that may indicate infection such as fevers, wound redness and drainage should be addressed. If the patient feels at any time that the strut has moved or there is chest pain, call the doctor.

Follow-up care: The patient should be seen by the surgeon a few weeks after surgery to check on the wound, the shape of the chest, and/or placement of the bar. These visits will continue until the bar is removed in 2-3 years. If a Ravitch Procedure is done, the strut may be removed sooner.

Long Term Outcomes - “Are there future conditions to worry about?”

The normal shape of the chest is maintained in the majority of children after the Ravitch or Nuss Procedure.

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Author: Marjorie J. Arca, MD
Editors: Marjorie J. Arca, MD; Laura Hollinger, MD