

Pectus Excavatum

Pectus excavatum, or funnel chest, is a congenital malformation of the anterior chest characterized by a prominent depression of the body of the sternum, usually involving its lower half to two-thirds. The lower rib cartilages bend posteriorly to form a depression. The first and second ribs, and the upper sternum are essentially normal. Asymmetric deformities are common, with the depression being deeper on the right with the sternum being rotated posteriorly to that side. In most instances however, the depression involves the lower half of the sternum and is symmetrical with a decrease in the depth of the chest cavity. The cause of pectus excavatum is unclear, but it has no relation to rickets (vitamin D deficiency). The most recent theory is that unbalanced growth in the rib cartilages that connect the bony rib to the sternum (costal cartilages) is the cause of pectus deformities. The cartilages are often fused, abnormally shaped, and rotated. This would explain the occasional asymmetric appearance, the frequent association of other defects in cartilage and bone formation at other skeletal sites, and other chest wall abnormalities occurring in family members.

Clinical Features

Pectus excavatum is inherited through either parent although the pattern is unclear. It occurs in 1 in 400 births and is uncommon in blacks and Hispanics. Other malformations may exist including spine curvature (scoliosis), clubfoot, hand abnormalities, Marfan and Klippel-Feil Syndrome. The deformity is usually apparent soon after birth, progresses during childhood, and becomes even more pronounced in early adolescence. Deep inspiration tends to accentuate the deformity. Regression rarely occurs spontaneously. Commonly the deformity worsens with the growth spurt that occurs in early adolescence.

Symptoms are infrequent during early childhood except for an unwillingness to expose the chest while swimming or taking part in other social or athletic activities. Decreased stamina and endurance may become apparent during early adolescence when children become involved in competitive sports. When the deformity is moderate to severe, the heart is considerably displaced into the left side of the chest, and lung expansion during inhaling may be limited, resulting in a "restrictive defect" on pulmonary function tests. Many of these patients are thin with poor posture and a protuberant abdomen.

A few methods of grading pectus deformities have been proposed. Most include some measurement of the distance between the sternum and the spine by chest x-ray or by CT scan. Standard chest radiographs usually show the heart to be displaced into the left side of the chest. EKG abnormalities are common and reflect heart displacement. Echocardiograms may show mitral valve prolapse, especially in patients with Marfan syndrome; mitral valve prolapse is rarely of clinical concern. A heart murmur is often present.

Treatment

Most surgeons performing surgery using a technique that involves resection of the rib cartilages currently wait until the children are at least into their adolescent growth spurt. Some surgeons prefer to delay repair until the chest has achieved full growth.

The standard surgical repair involves general anesthesia. A transverse chest incision is made over the depressed sternum. The chest muscle is elevated to expose the sternum and ribs. The lower deformed rib cartilages are removed on both sides of the sternum. The outer bony edge of the sternum is cut above the sunken portion to create a hinge that can be used to elevate the lower sternum. A stainless steel bar is placed behind the sternum and sewn to the adjacent ribs to maintain the new position of the sternum. The bar is generally removed 6 months to one year later through a lateral chest incision as an outpatient.

The hospital stay varies from 5 to 7 days. The chest should be protected from direct trauma for 4 to 6 weeks. Rib cartilages regenerate after 2 months and provide a rigid support for the chest wall. Patients can return to full physical activity, including body contact sports, after the metal bar is removed. Surgical complications include migration of the pectus bar which may require repositioning. Pneumothorax (air collection in the chest) occurs in less than 10% and usually resolves on its own.

Recently, a new method of pectus repair was devised by Dr. Nuss (the Nuss Procedure) in which the sternum is elevated without removal of the rib cartilages. A curved steel bar is placed under the sternum through two lateral chest incisions often with the use of a camera (thoracoscope) to guide its passage. The bar must be left in for two years to allow for permanent remodeling of the rib cartilages. Studies indicate the two methods of repair are comparable in length of hospital stay, pain medicine requirements and patient satisfaction.