

The Nuss Procedure for Pectus Excavatum

The condition

Pectus excavatum is a depression of the sternum and anterior chest. The deformity is sometimes referred to as sunken or funnel chest and may appear as though someone has punched in the chest. The severity of the depression ranges from mild to severe. Mild cases may respond to an exercise and posture program, whereas more severe cases require surgical correction.

Pectus excavatum tends to run in families and is often present at birth. The deformity usually progresses as the child grows, often showing dramatic deterioration during the pubertal growth spurt.

The Nuss Procedure - a new, minimally invasive and safe way for correction of pectus excavatum.

In the past, a variety of radical procedures were advocated. However, in 1987 a new technique for correction of pectus excavatum was developed by Dr. Donald Nuss, a pediatric surgeon at Children's Hospital of the The King's Daughters and Eastern Virginia Medical School in Norfolk, Virginia. This "minimally invasive" procedure has been refined and modified for more than fifteen years in over 450 patients. **The Nuss Procedure** for the correction of pectus excavatum results in minimal blood loss and much shorter recovery time. In addition, Dr. Nuss and Children's Hospital have developed a center for pectus excavatum care which includes not only non-operative treatment for milder cases but operative and post-operative clinical pathways and standards of care. A comprehensive pectus program has been developed that includes a Nurse Coordinator, Pediatric Anesthesia, Child Life Therapy and Physical Therapy along with patient and family education materials, to complement this revolutionary new surgical procedure.



The indications for surgery.

Surgical correction of pectus excavatum is done for medical reasons. Children with moderate to severe defects often experience shortness of breath, exercise intolerance and chest pain. These are the results of compression and displacement of the heart and secondary lung compression.

Preoperative screening and evaluations.

After a complete health history, a thorough physical exam, chest measurements, and photographs, children whose condition is considered severe enough to warrant surgery are sent

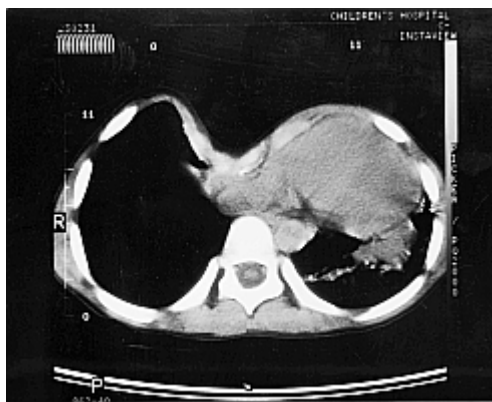
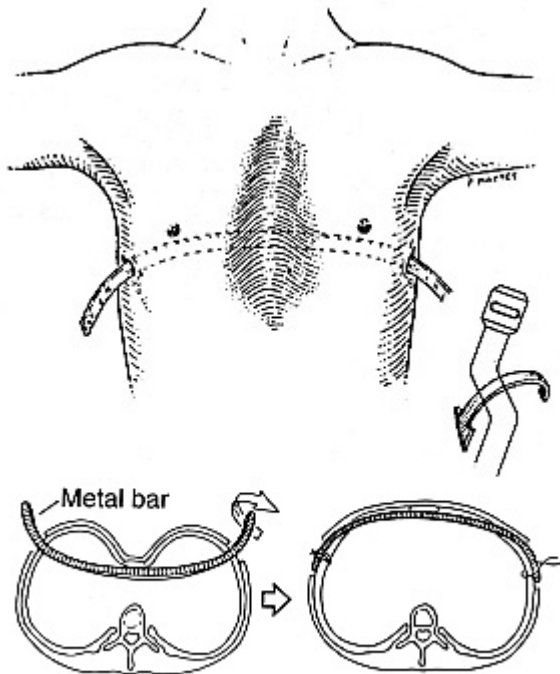
for further evaluation of their cardiac status, pulmonary function, and a CT scan. These studies help determine whether the patient fulfills the criteria for surgery, since not every child requires surgical correction.

Age as a consideration.

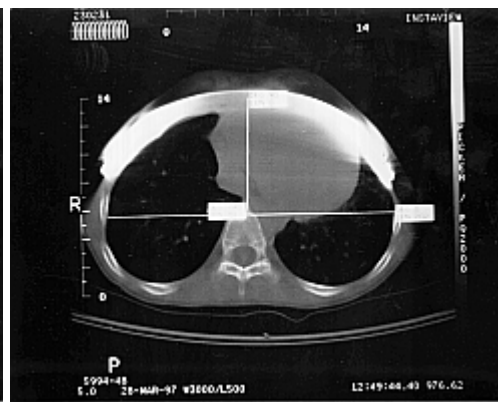
The operation is easier and the recovery time faster in children who are preadolescent, because their bones and cartilage are more flexible. However, there has been an increase in the number of teenagers undergoing the procedure and results are equally good in older patients up to the mid-twenties.

The operation.

The operation for correction starts with general anesthesia and the placement of an epidural catheter for the management of pain after the operation. Two lateral incisions are made on either side of the chest for insertion of a curved steel bar under the sternum. A separate, small lateral incision is made to allow for a thoroscope (small camera) for direct visualization as the bar is passed under the sternum. The bar is individually curved for each patient. The bar is used to pop out the depression. It is then fixed to the ribs on either side and the incisions are closed and dressed. A small steel, grooved plate may be used at the end of the bar to help stabilize and fix the bar to the rib. The bar is not visible from the outside and stays in place for a minimum of two years. When it is time, the bar is removed as an outpatient procedure.



Pre-operative



Post-operative

Complications.

Complications of this minimally invasive surgery are uncommon. Air in the chest (pneumothorax) is the most frequent complication but usually requires no treatment other than observation and

aggressive deep breathing therapy to help promote faster resolution. Bar displacement may occasionally require repositioning, and as with all surgeries, the potential for infection is closely monitored and presently the infection rate is less than 1%.

Recovery and return to normal activity.

The immediate recovery time in the hospital is 4-5 days. Attention is paid to postoperative pain management, encouragement to breathe deeply, assistance with movement (so as not to dislodge the bar), and patient/parent education. After discharge, the patient is expected to slowly resume normal, but restricted, activity. Most children are able to return to school in two to three weeks, with exercise restrictions for six weeks (i.e. no physical education, no heavy lifting, etc.). Once fully recovered they may return to regular activity.

Bar removal.

The pectus support bar is removed between two to four years after insertion on an outpatient basis. The procedure is done under general anesthesia and in over 160 patients who have had their bars removed there were no complications. Patients were able to leave the hospital within one to two hours after bar removal. Patients who reside more than one hour from the hospital are expected to spend their first night in town.

Long-term results.

Long-term follow-up (over 15 years) shows the Nuss Procedure provides excellent results with less than 5% recurrence of the deformity after the bar is removed.

For more information on Pectus Excavatum and the Nuss Procedure, click on:

- [Sunken chest, raised hopes: New surgery fixes deformity with less trauma than ever](#)
- [Abstract of a paper presented in May 1997 at a meeting of the American Pediatric Surgery Association](#), by Donald Nuss, MB, ChB, Robert E. Kelly Jr., MD, Daniel P. Croitoru, MD, Michael E. Katz, MD, and Barbara Swoveland, RNC, MSN, Departments of Surgery and Radiology, Children's Hospital of The King's Daughters and Eastern Virginia Medical School, Norfolk, Virginia.
- Nuss, D, Kelly Jr RE, Croitoru DP, Katz ME. A 10 Year Review of a Minimally Invasive Technique for the Correction of Pectus Excavatum. J Pediatr Surg 1998 April; 33(4): 545-552
- Nuss, D, Kelly Jr RE, Croitoru DP, Swoveland B. Repair of Pectus Excavatum. Pediatric Endosurgery & Innovative Techniques. 1998 Winter; 2(4): 205-221
- Croitoru DP, Kelly RE Jr, Goretsky MJ, Lawson ML, Swoveland B, Nuss D. Experience and Modification Update for the Minimally Invasive Nuss Technique for Pectus Excavatum Repair in 303 Patients. J. Pediatr Surg 2002 March.