

Pectus Excavatum

A 10-Year Review of a Minimally Invasive Technique for the Correction of Pectus Excavatum

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ABSTRACT

Purpose: To assess the results of a 10-year experience with a minimally invasive operation which requires neither cartilage incision nor resection for correction of pectus excavatum.

Method: From 1987 to 1996, 148 patients were evaluated for chest wall deformity. Fifty of 127 patients suffering from pectus excavatum were selected for surgical correction. Eight older patients underwent the Ravitch procedure and 42 patients under age 15 were treated by the minimally invasive technique. A convex steel bar is inserted under the sternum through small bilateral thoracic incisions. The steel bar is inserted with the convexity facing posteriorly, and when it is in position, the bar is turned over, thereby correcting the deformity. After two years when permanent remodeling has occurred, the bar is removed in an outpatient procedure.

Results: Of 42 patients who had the minimally invasive procedure, 30 patients have undergone bar removal. Initial excellent results were maintained in 22, good four, fair two, poor two, with mean follow-up since surgery of 4.6 years (1-9.2 years). Mean follow-up since bar removal is 2.8 years (6 months-7 years). Average blood loss was 15 ml. Average length of hospital stay was 4.3 days. Patients returned to full activity after one month. Complications were: pneumothorax in four patients, requiring thoracostomy in one patient; superficial wound infection in one patient; and displacement of the steel bar requiring revision in two patients. The fair and poor results occurred early in the series because a) the bar was too soft (three patients), b) the sternum was too soft in one

of these patients with Marfan's syndrome, and c) in one patient with complex thoracic anomalies, the bar was removed too soon.

Conclusion: This minimally invasive technique, which requires neither cartilage incision nor resection, is effective. Since increasing the strength of the steel bar and inserting two bars where necessary, we have had excellent long term results. The upper limits of age for this procedure require further evaluation.

Additional reference:

Repair of Pectus Excavatum, by Donald Nuss, MB, ChB, Robert E. Kelly, Jr., MD, Daniel P. Croitoru, MD, and Barbara Swoveland, RNC, MSN, Journal of Laparoendoscopic & Advanced Surgical Techniques (Part B, Winter 1998).

FIGURES

Note: For the figures below, click on the small version of a figure to see an enlarged version. The enlarged versions are approximately 105k in size on average, so they may take a few moments to download. After viewing an enlarged photo, use the 'Back' button in your browser to return to the document.



Figure I:
Patient K.C., age 11, one month before surgery.

Click on image to enlarge



Figure II:
Patient K.C., age 11, four months post pectus repair. Note incision in left lateral chest.

Click on the image to enlarge



Figure III:
Patient M.B. Chest CT showing severe asymmetric pectus excavatum (CT index 8.5) with severe cardiac compression and displacement, and pulmonary

atelectasis.

Click on the image to enlarge

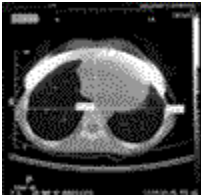


Figure IV: Patient M.B., eight months post pectus repair, CT showing inferior pectus bar, heart in normal position, no cardiac compression, pulmonary atelectasis resolved.

Click on the image to enlarge



Figure V: Patient K.C. at time of surgery showing pectus bar in position, molded to conform to desired anterior chest wall curvature with snug lateral fit.

Click on the image to enlarge



Figure VI-A: Long curved Kelly clamp advanced across mediastinum deep to sternum.

Click on the image to enlarge



Figure VI-B:

Diagram showing convex steel bar being guided into the substernal tunnel using umbilical tape to keep it on track.

Click on the image to enlarge

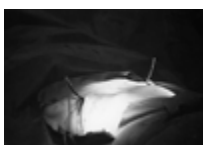


Figure VII-A:

Patient K.C. showing pectus bar positioned deep to sternum with concavity facing posteriorly and umbilical tape still attached to one end.

Click on the image to enlarge

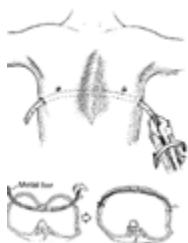


Figure VII-B:

Diagram showing steel bar in the process of being turned over.

Click on the image to enlarge



Figure VIII:

When two bars are used the two ends may be linked together with cross bars to form a rectangle.

Click on the

image to
enlarge



Figure IX:
Patient R.R. 1986. Severe pectus excavatum.
Two years before pectus repair.

Click on the
image to
enlarge



Figure X:
Patient R.R. 1992. Four years post pectus
excavatum repair, two years post bar
removal.

Click on the
image to
enlarge



Figure XI:
Patient R.R. 1996. Eight years post pectus
excavatum repair, six years post bar removal.

Click on the
image to
enlarge



Figure XII:
Patient H.P. 1986. Severe pectus excavatum.
Six months before pectus repair.

Click on the
image to
enlarge

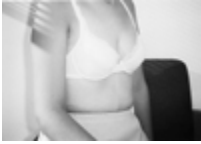


Figure XIII:
Patient H.P. 1996. Nine years post pectus excavatum repair, six years post bar removal.

Click on the
image to
enlarge



Figure XIV:
Patient W.J. 1989. Severe pectus excavatum. Ten months before pectus excavatum repair.

Click on the
image to
enlarge



Figure XV:
Patient W.J. 1991. Two years post pectus excavatum repair, one month post bar removal.

Click on the
image to
enlarge



Figure XVI:
Patient W.J. 1991. Two years post pectus excavatum repair, one month post bar removal.

Click on the
image to
enlarge



Figure XVII:
Patient W.J. 1996. Seven years post pectus excavatum repair, five years post bar removal. Note normal chest expansion and

flexibility at full inspiration.

Click on the image to enlarge



Figure XVIII:
Patient W.J. 1996 Seven years post pectus excavatum repair, five years post bar removal.

Click on the image to enlarge



Figure XIX:
Patient S.H. 1986 Pectus excavatum. Ten months before pectus repair.

Click on the image to enlarge



Figure XX:
Patient S.H. 1987. Two months post pectus excavatum repair.

Click on the image to enlarge



Figure XXI:
Patient S.H. 1989. Two years post pectus excavatum repair. Bar still in place. Note normal chest expansion and flexibility on full inspiration.

Click on the image to

enlarge



Figure XXII:
Patient S.H. 1991. Four years post pectus excavatum repair. Immediately prior to bar removal.

Click on the
image to
enlarge



Figure XXIII:
Patient S.H. 1995 Eight years post pectus excavatum repair, four years post bar removal. Completely normal chest contour and flexibility.

Click on the
image to
enlarge