Videothoracoscopic extrapleural insertion of Walter Lorenz Surgical bar for pectus excavatum

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Since 1949, the standard for correction of pectus excavatum is the Ravitch procedure¹ and the modifications that have been introduced over time. The operation includes either subperichondrial incision or excision of involved cartilage and transverse osteotomy of the sternum, with or without an internal support or some prosthetic appliance.² In 1997, a new minimally invasive technique for correction of pectus excavatum based on orthopedic principles was introduced by Nuss and associates.³ The new procedure avoids the anterior chest wall incision and requires neither sternal osteotomy nor excision of any rib cartilage.

The pectus support bar rapidly gained in acceptance among pediatric and thoracic surgeons. However, some complications were reported,^{4,5} including pericarditis, cardiac injury, and anterior thoracic artery pseudoaneurysm. In an attempt to minimize the morbidity, we introduced a modification to the Nuss procedure, placing the bar extrapleurally.

The patient selection, the length of the steel bar (Walter Lorenz Surgical Inc, Jacksonville, Fla), and the operative technique are as described by Nuss and associates.³ All patients undergo preoperative computed tomography and pulmonary function testing. We only support echocardiography when cardiac compression is suspected. We use a double-lumen tube and an epidural catheter for postoperative pain control in all patients. Through the right transverse axillary incision, we introduce the thoracoscope. After the skin tunnel is made, we enter the previous selected intercostal space with a 30-cm-long curved Kelly clamp, taking care not to break the pleura. In the original technique the Kelly clamp is advanced inside the pleural cavity across the mediastinum just

Figure 1. Chest x-ray film visualizing the pectus bar in its post-operative position.

under the sternum. Because this maneuver could be difficult and dangerous in older patients and in patients with severe asymmetric deformities, we prefer to advance extrapleurally under scope control, crossing over the right anterior thoracic vessels and continuing on immediately under the sternum until the clamp reaches the left selected intercostal space. Although there are surgeons who do not use the thoracoscope routinely,⁴ we always use it on the right side to maximize visualization of the extrapleural path. The use of the thoracoscope on the left side is not necessary because the distance you have to cover until you reach the assistant finger on the other side is so small that safety is considered. Then, as with the Nuss procedure, a tape is passed through the extrapleural tract to use as a guide; the bar is firmly knotted and pulled between the sternum and the parietal pleura. As usual, the bar is turned over until the convexity faces anteriorly and is fixed with the lateral

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Figure 2. Schematic view of extrapleural insertion of the pectus bar. On the right side, the lung, represented as a *gray shadow*, is partially collapsed. *Th*, Thoracoscope; *C*, clamp; *PP*, parietal pleura; *ATV*, anterior thoracic vessels; *T*, tape; *B*, Bar.

stabilizers. To secure them, we use heavy sutures around the junction between the pectus bar and the stabilizer and between the bar and the chest wall muscles (Figures 1 and 2). Also, a suture around the rib could be done on the upper side. An 8F chest drainage (Pleurocath; Laboratoire Plastimed, Saint Leu la Forêt, France) is left in the right hemithorax (Figure 1).

When a new technique is being performed, strict adherence to the original described procedure is important to diminish complications, but modifications can improve the final results. In our experience this modification is safer and easier, it does not require expenditure of more time than the original operation, and blood loss continues to be minimal. If used gently, the clamp will damage neither the anterior thoracic vessels nor the parietal pleura. Placing the bar extrapleurally allows us to change to another intercostal space without opening the pleural space if the result is not as good as desired. Because the bar is safer and easier to remove extrapleurally, in an asymmetric pectus it could be possible to place it in different intercostal spaces in each hemithorax (Figure 2).

We conclude that videothoracoscopic extrapleural insertion of the Walter Lorenz Surgical bar is safe, permits correct placement, and prevents important complications.

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