Operative correction of pectus excavatum

Experience at the children's hospital of Bremen

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Abstract. The Rehbein operation for pectus excavatum has been in use at the Children's Hospital of Bremen since 1955. This procedure involves presternal sternum fixation: after mobilization of the concavity, the elevated sternum is held in a position of slight overcorrection by steel splints and metal bands that are left in place for 3 years. The operation is most likely to succeed in children between 6 and 8 years or over 12 years of age. Surgery is indicated for all severe deformities; moderate forms should be operated upon only when ventilation disturbances, cardiac displacement, or psychological disorders are present. The operative results with this procedure are comparable to those achieved by other operations: we had good results in 69.2%, satisfactory in 18.3% and poor in 12.5% of cases.

Keywords: Pectus excavatum – Sternal fixation – Rehbein operation

Operative technique

Since 1955, presternal sternum fixation using prosthetic implants has been favored by pediatric surgeons at the Children's Hospital of Bremen. Like all operations for pectus excavatum, this entails three stages: (1) mobilizing the soft tissue structures; (2) correcting the concavity; and (3) stabilization of the anterior chest wall.

Soft-tissue mobilization

The skin, subcutaneous fat, and linea alba are divided via a long midline or arched transverse incision, preserving the sternal periosteum and peritoneum. The abdominal cavity remains closed. It is necessary to split the linea alba in order to expose both costal arches completely. The wound edges are grasped using two sharp retractors and the pectoralis and serratus anterior insertions are freed by means of scissors and rasp from the cartilage of the chest wall. Careful hemostasis is mandatory. The medial extent of the dissection depends upon the width of the concavity and usually does not extend beyond the nipple line. The rectus abdominus muscle is dissected free at its origin on both sides and, together with the laterally adjoining abdominal muscles, displaced sideways until the costal arches are completely exposed.

Mobilization of the concavity

The concavity must be radically mobilized: costal cartilages 3 through 10 (or 2 through 10) are divided on both sides at the sternal borders and along the costochondral borders, using a narrow Läfer rongeur. With each division a piece of cartilage 2–3 mm wide falls away. No particular protection of the perichondrium is necessary. An indentation is then made in the sternum at the 3rd or occasionally 2nd intercostal space and the xyphoid process is removed, after which the sternum is grasped with a pronged clamp and lifted. After transverse division of the lateral and retroster-
nal tissues and detachment of the anterior mediastinum from its posterior surface, the sternum is completely free and is pulled upward and anteriorly and bent downward at the indentation.

The inner surfaces of the costal arches are now dissected free. Supporting these with a sharp retractor, the costal insertions of the diaphragm are undermined and divided using a small rasp and fine scissors. The adjacent pleura can be freed cautiously using a dissecting sponge; damage to the pleura can occur at this point and is more common on the right side than the left.

Stabilization of the anterior chest wall

Stabilization is achieved using steel splints (Fig. 1) bent to the contours of the ribs. These are anchored in pairs with the narrow, short limb in the marrow cavity of the rib. They are available in four different sizes. In succession, the ribs suitable for receiving the braces are selected, usually the 3rd, 4th, and 5th ribs. The proximal pair of splints crosses the sternum slightly above the midpoint and the distal pair inferiorly. The third pair lies distal to the tip of the sternum and will later be used to remodel the costal angle.

A cross-shaped incision is now made in the periosteum 1–2 cm lateral to the costochondral margin and the narrow cavity is opened with a small Still rongeur transversely to the line of the rib. The narrow cavity is expanded, using narrow, spatulate instruments, after which the foot of the metal splint can be inserted under pressure. The sternum is suspended from the two uppermost pairs of braces with steel bands (Fig. 2) so that the desired overcorrection of the sternum is achieved. The third, lowest pair of splints holds the two costal arches up by means of U-shaped, gathered loops of steel wire [22, 23].

To prevent parasternal retraction and reconstruct the rib contours as completely as possible, the remaining loose fragments of costal cartilage are fastened with steel bands to the arches formed by the metal splints on both sides. Any remaining uneven spots can be smoothed using a