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Pectus carinatum successfully treated with bracing

A case report

C. H. Mielke[1] and R. B. Winter[2]

[1] Orthopaedic Surgery Resident, Mayo Clinic; Rochester, MN 55905, USA
[2] Minnesota Spine Center, 606 24th Avenue South, Suite 606, Minneapolis, MN 55454-1419, USA

Summary. *We report the case of a 14 year old girl who desired treatment for a cosmetically objectionable pectus carinatum deformity. She was initially managed with a corrective underarm body cast for six weeks followed by fulltime bracing for seven months. Subsequently, she was braced only at night for another eight months. Seven years after the onset of treatment she had an excellent result without recurrence of deformity. In a well-motivated, skeletally immature individual bracing can be an effective treatment for cosmetically displeasing pectus carinatum.*

Résumé. *Nous présentons le cas d'une jeune fille de 14 ans traitée pour un thorax en carène (pectus carinatum). Elle a été traitée initialement par un corset plâtré pendant six semaines, suivi d'un corset orthopédique pendant sept mois. Le même corset a ensuite été porté seulement la nuit pendant huit mois. Sept ans plus tard la patiente a un résultat cosmétique excellent, sans récidive. Chez un sujet bien motivé, en cours de croissance, le port d'un corset orthopédique peut être efficace dans la correction d'un thorax en carène, pour raison esthétique.*

Background

Pectus carinatum ("pigeon breast") is a protrusion deformity of the anterior chest wall. It can be an isolated anomaly, or it can appear in conjunction with numerous conditions, particularly cyanotic congenital heart disease. It is also seen in Noonan's syndrome, osteogenesis imperfecta tarda, the Morquio syndrome, the prune belly syndrome, spondyloepiphyseal dysplasia congenita, homocystinuria, and the Marfan syndrome. The overall prevalence of pectus carinatum is 0.06%, and males are more commonly affected than females. The lower end of the sternum is most commonly involved. Depression or asymmetry of the costal cartilages on either side of the sternum is common. *Pectus carinatum* is often not noticed until school begins. Progression of deformity around the time of puberty is not unusual [3, 4, 5].

At least three types of deformity have been described [13, 14]. Type I, or "keel chest" deformity, is a symmetrical protrusion of the sternum and costal cartilages. Type II deformity has been called "arcuate pectus carinatum" by Lester [10] and "pouter pigeon breast" by Ravitch [12]. Typically, there is an anterior prominence of the manubrium and the first two sternocostal cartilages. The body of the sternum arches posteriorly, and the tip of the xiphoid process points anteriorly. Type III is asymmetrical or lateral pectus carinatum which is a unilateral protrusion of the anterior chest wall, sometimes associated with a contralateral depression. Others have described a fourth type which is a combination of pectus carinatum and excavatum [11].

The orthopaedic literature on pectus carinatum is scarce. Waters et al. in 1989 investigated the association of pectus carinatum and excavatum with scoliosis [18]. Of 569 patients who had operative correction of deformities of their chest wall, 21% had scoliosis. No mention was made of nonoperative treatment of their chest deformities.

Numerous operations for the correction of pectus carinatum have been described in the thoracic sur-

Reprint requests to: R. B. Winter

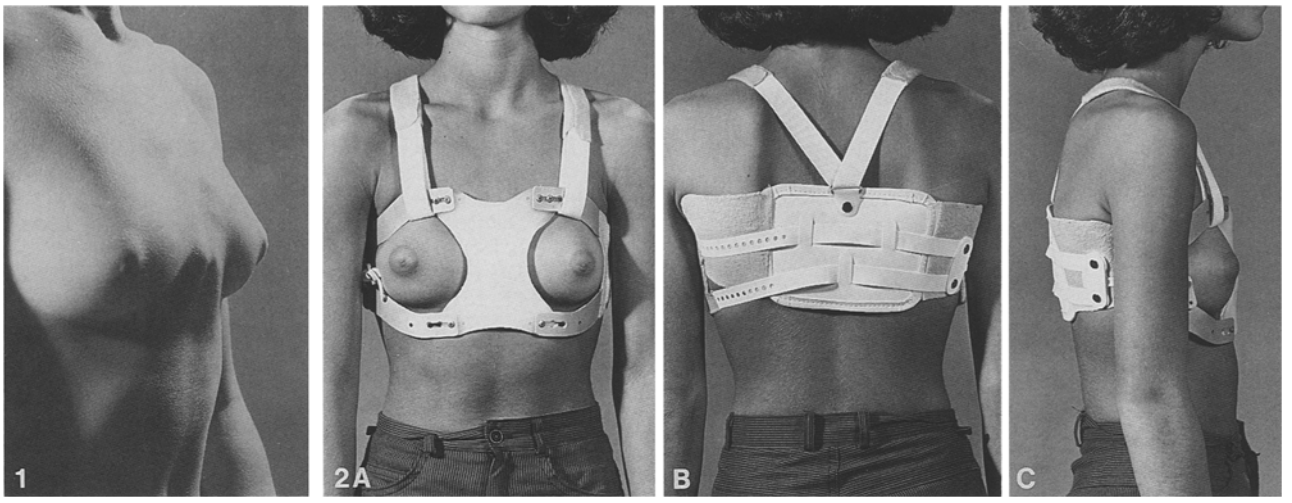

Fig. 1. Photograph before treatment. Note protrusion of the lower end of the sternum

Fig. 2. **A** Anterior, **B** posterior, and **C** lateral views of custom-made brace

gery literature [6, 9, 13–17]. Nonoperative treatment including casting and bracing have rarely been mentioned, and only to be condemned as universally ineffective [7]. Jaubert de Beaujeu et al., in 1964, described serial casting of a three year old boy with pectus carinatum using a technique attributed to Charles Picault [8]. This involved applying corrective forces with a strap across the sternal prominence. Correction was then maintained with a body cast. They achieved a good cosmetic result after one year. They also stated that the lateral rib depressions were only partially corrected after casting.

Bianchi, in 1968, reported twenty patients treated with casting followed for 4 to 24 months [1]. He described pectus carinatum as "sternal kyphosis" which was correctable with casting. A modified windowed body cast was used to attain correction. A wooden bar was placed in the cast over the area of sternal prominence. This was attached by screws to a pressure platform outside of the cast. By tightening the screws, a posteriorly-directed vector of force could be transmitted to the sternum via the bar in the cast. The screws were turned daily for 30 to 40 days. Photographs and radiographs documented correction. The authors noted that the lateral sternocostal depressions did not disappear. They also observed that the concavity of the ribs could increase. Treatment with corrective casting was seen by the senior author (RBW) in 1973 at the clinic of Alberto Ponte in Pietro Ligure, Italy.

Case report

A 14 year old girl was seen in 1983 by the senior author complaining of a distressing prominence of her sternum. It had increased in size over the previous year to the point where classmates in school noted the deformity during swimming. On examination, she had a symmetrical elevation of the chest wall involving the lower third of the sternum (Fig. 1). No deformity of the spine was seen. She had no other anomalies or medical conditions. The options for treatment discussed with the patient included observation, orthotic treatment, and operation. The patient and her family decided to try nonoperative treatment. She was initially placed in a windowed underarm body cast with carful anterior and posterior molding. Three weeks later she returned to have a pad placed behind the front of the cast. After six weeks the cast was removed and a special brace made with anterior and posterior plastic shells. The anterior shell was connected to a fastening device by upper and lower metal supports. The fastener was located laterally, and could be adjusted to increase the amount of pressure exerted on the front of the sternum. All pressure areas were well padded. The final brace was of a very low profile and well tolerated by the patient (Fig. 2). She was followed closely and brace adjustments were

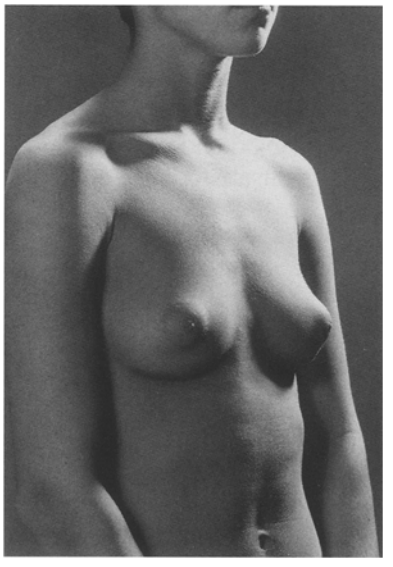

Fig. 3. Cosmetic result at final visit

made as necessary. She was instructed on periodic tightening of her brace, which was worn full-time for seven months and at night only for a further ten months. Her last visit was two years after the onset of treatment. Clinically, the midline prominence was gone. There was a slight amount of right-sided sternocostal prominence. Both the patient and her parents were pleased with the final result when contacted in 1990, seven years after treatment began and five and one-half years after discontinuing the brace (Fig. 3).

Conclusion

Pectus carinatum is an infrequent clinical problem that can occasionally present as a cosmetic deformity. Unlike pectus excavatum, isolated pectus carinatum is not associated with respiratory compromise [2]. Consequently, operation is undertaken for cosmesis only.

Little is known about the nonoperative treatment of pectus carinatum. We do not know if a more significant protrusion than that of our patient could be successfully braced. Treating a cosmetic problem without leaving a surgical scar has its merits. This case has taught us that pectus carinatum can be managed effectively by casting followed by bracing in a motivated patient with growth potential remaining. If the end result of bracing is unsatisfactory, operation may still be performed.

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