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# The Thermal Emission From the Skin and the Vascularity of the Breasts in Normal and Scoliotic Girls

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The vascularity of the breasts was examined by thermographic and diaphanographic methods in normal and scoliotic girls. The thermal emission from the skin registered with an AGA Thermovision 750 camera (Stockholm, Sweden) on black and white Polaroid film was evaluated visually by 10 independent observers. No significant differences between the thermal images of the left and the right breast were found in the control or scoliotic groups or in girls with a right convex thoracic curve, nor was there any significant difference between the groups in this respect. Image analysis of diaphanograms of the breasts using the GOP 300 system showed a significantly greater vascularity of the left breast than of the right, both in the scoliotic series as a whole and in the subgroup with a right convex thoracic curve, but not for the reference group. The vascularity of the left breast but not of the right one was significantly greater for the girls with a right convex thoracic curve than for the control group. The results of the diaphanographic study confirm earlier observations and together provide substantial evidence that unilateral stimulation of rib growth due to a greater vascularity of the left breast and the underlying costosternal junctions might be one initiating factor in the development of right convex thoracic idiopathic scoliosis in adolescent girls. [Key words: adolescent idiopathic scoliosis, breast vascularity]

**S**OMATOMETRIC DATA relating to the thorax of normal and scoliotic persons are few. Asymmetric development of the breasts has been recorded in from 12% to 63% of normal subjects, and breast asymmetry has been found to be significantly more common in scoliotic than normal girls, the left breast being significantly more highly developed in the former.<sup>9</sup> A significant mean difference in rib length (left minus right) between normal women and men, and between patients with right convex thoracic scoliosis (concave, left, minus convex, right) and normal women (left minus right).<sup>10</sup> These and earlier experimental observations<sup>13</sup> suggest that asymmetry of rib length can in some cases be a primary cause of idiopathic scoliosis.

The longitudinal growth of the ribs of animals occurs mainly in the growth zone of the costosternal junction.<sup>14</sup> On the assumption that longitudinal growth is stimulated by hyperemia, the present investigation was undertaken to examine whether there is evidence

of hypervascularity of the left thorax that could explain the greater length of the left ribs observed in patients with right convex thoracic idiopathic scoliosis. In normal subjects and scoliotic girls, the surface temperature of the anterior thoracic half was registered by thermography, and the deep vascularity of the paired breasts was recorded by diaphanography.

## PROBANDS

The material for this study was drawn from 63 scoliotic and 28 normal girls. Fifteen scoliotic girls were excluded for various reasons, no available radiographic data (9), Cobb angle 7° or less (5), and kyphoscoliosis (1). Diaphanography was performed in all the girls, and thermography in only some of them.

## Scoliotic Series

Forty-eight of the scoliotic girls, with a mean age of 15.7 ± 1.7 years, composed this series (Table 1).

**Thermographic Study.** Thermography was performed on 20 scoliotics with a mean age of 15.9 ± 1.9 years. Fourteen had a right convex thoracic curve.

**Diaphanographic Study.** The series for this study consisted of 33 girls with a mean age of 15.7 ± 1.6 years. Twenty-one had right convex thoracic scoliosis. The diaphanograms of 15 girls were not of good enough quality for image analysis with the GOP 300 system.

## Reference Groups

The original reference material consisted of 28 normal girls with a mean age of 15.6 ± 1.8 years. Most of them were patients at the Outpatient Clinic who were receiving treatment for minor extremity trauma. None had any spinal deformity (Table 1).

**Thermographic Study.** Thermography was performed on 10 normal girls with a mean age of 15.8 ± 1.7 years.

**Diaphanographic Study.** This reference group consisted of 21 girls with a mean age of 15.6 ± 1.8 years. The diaphanograms of seven girls were discarded because they were of too poor quality for image analysis.

## METHODS

**Thermography.** Thermograms of the anterior thorax were obtained with an infrared camera, AGA Thermovision, Model 750 (Stockholm, Sweden). Prior to the exposure the girl was seated in the draught-free examination room for 5 minutes with the upper part of the body bare to allow equilibration of the body tempera-

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