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INITIAL CORRECTION WITH THE BOSTON THORACIC BRACE

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The Boston Thoracic Brace, i.e. a Boston Brace without superstructures, has been used for treatment of scoliosis in 57 patients with 91 major curves measuring 31.8 ± 6.5°, the apex of the scolioses varying from D 7 to L 3. There was a mean correction of 12.9 ± 6.4° (41 per cent), which was superior to that of the Milwaukee Brace also in the thoracic scolioses (mean correction 3.6 ± 5.8°) (10 per cent).

Key words: Boston Brace; brace treatment; Milwaukee Brace; scoliosis

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The introduction of the Boston Brace System was a great step forward in the non-operative treatment of scoliosis since patients with lumbar and thoracolumbar curves could be treated with braces without superstructures, thereby avoiding its cosmetic disadvantages and discomfort. Furthermore, the initial correction was better than that with the Milwaukee Brace (Watts et al. 1977).

With increasing experience of the Boston Brace System, interest has been focused on the so-called Boston Thoracic Braces, i.e. Boston Braces without superstructure for treatment of thoracic curves.

Since 1979 so-called Boston Thoracic Braces have solely been used in the non-operative treatment of idiopathic scoliosis including all thoracic curves at the Malmö General Hospital. In this paper the initial correction obtained will be presented and compared with that of the formerly used conventional Milwaukee Brace.

MATERIAL AND METHODS

The indication for brace treatment was an idiopathic scoliosis exceeding 24° or 20° and with an observed progress of more than 4° in patients with an estimated remaining growth period of at least 1 year judged from skeletal age according to Greulich & Pyle (1959).

The scolioses were considered double primary if there were structural changes in both curves or the difference between the two curves was less than 5°. This means that a few of the curves will measure less than 20°.

A comparative study was made between 57 consecutive cases admitted in 1979–80 and all treated with Boston Thoracic Braces and 68 consecutive cases admitted in 1974–76 and treated with conventional Milwaukee Braces. Patients admitted in 1977 and 1978 are not included in this study because Milwaukee Braces, Boston Milwaukee Braces and Boston Braces were used on different indications during this period.

Out of the 57 patients treated with Boston Thoracic Braces five were boys. The mean age of the girls was 13.2 ± 2.4 years and of the boys 15.6 ± 3.1 years. There were 23 single curves and 34 double curves. Each double curve is counted as two separate curves. This makes a total number of 91 curves that measured 31.8 ± 6.5°. Out of the 68 patients who received a conventional Milwaukee Brace six were boys. The mean age of the girls was 14.0 ± 1.9 and of the boys 13.4 ± 2.3 years. There were 45 single curves and 23 double curves, altogether 91 curves. The curves measured 34.7 ± 8.4°. Table 1 shows the magnitude of the curves as a function of apex. The curves were measured according to Cobb (1948). The statistical test used was Student's t-test.

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Table 1. Number and magnitude of curves at different levels

Apex	Boston Brace		Milwaukee Brace	
	n	Degrees (Mean±S.D.)	*n*	Degrees (Mean±S.D.)
D 7	2	29±1	9	36±10
D 8	30	31±7	21	35± 9
D 9	15	30±6	13	36± 8
D 10	7	33±8	6	37± 9
D 11	1	29	5	37± 9
D 12	3	34±7	5	30± 5
L 1	13	31±7	16	36±10
L 2	17	36±6	12	32± 7
L 3	3	30±3	4	31± 3
Total	91	31.8±6.5	91	34.7±8.4

Preparation of the brace

A prefabricated Boston module was used. The brace was prepared to reach up to the axilla on the concave side of the thoracic curve to give a resistance against the pad of the convex side which was applied just below the apex as recommended by the Boston group.

The horizontal support of the axilla was made 40–50 mm wide and should reach as high as the patient can

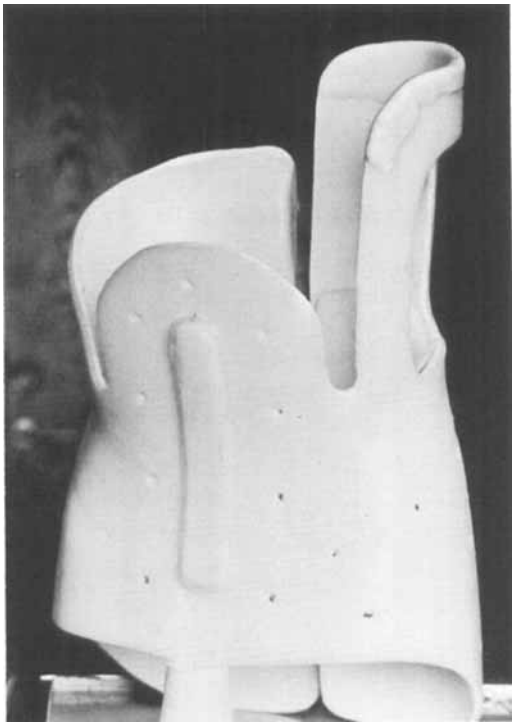

Figure 1. A Boston Thoracic Brace designed for a double curve.

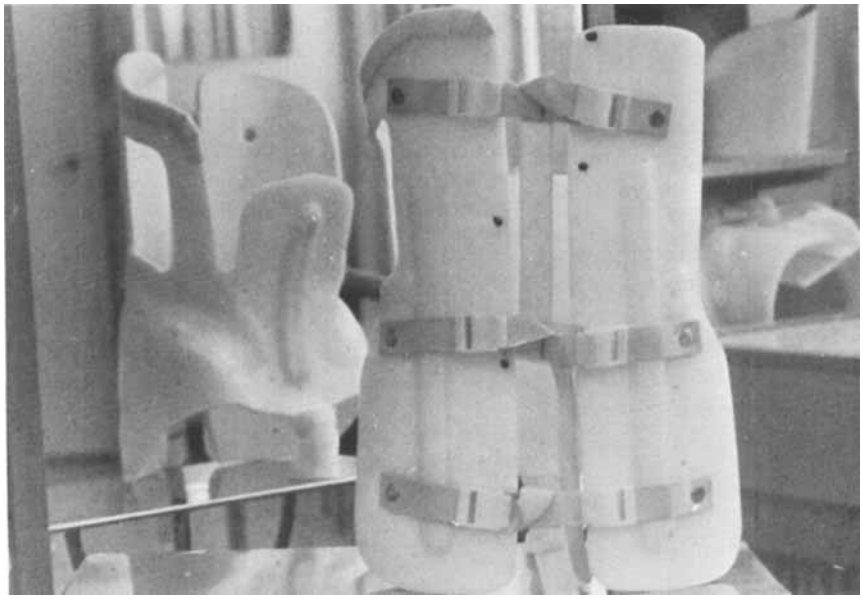

Figure 2. Back view of a Boston Thoracic Brace. The dots close to the opening mark the position of the pads.

tolerate. From the pelvic girdle there was one anterior and one posterior bar to the axilla support. The anterior bar was made 35–40 mm wide and placed as far anteriorly as possible without interfering with the breast. The posterior bar was made 80–100 mm wide and thoraco-lumbar pads could be attached to it if demanded. The waist straps were also attached to the posterior bar (Figures 1 and 2).

RESULTS

The initial correction of the Boston Thoracic Brace was about four-fold greater than the correction of the Milwaukee Brace (Table 2). The difference is statistically significant ($P < 0.001$). The initial correction of the Boston Thoracic Brace was significantly better than the Milwaukee Brace in thoracic and thoraco-lumbar as well as in lumbar curves. The correction of the Boston Thoracic Brace and the Milwaukee Brace seems to be somewhat better in curves with the apex in lower thoracic spine and in thoraco-lumbar curves, but the Boston Thoracic Brace has a good correction in all thoracic curves. However, there were too few curves with apex at D 7 for any conclusion (Table 2).

A positive correlation was seen between the correction achieved by both types of braces and the magnitude of the curves (Table 3), i.e. the correction as a percentage was almost the same between 20 and 45°.

DISCUSSION

The Milwaukee Brace was the first non-operative treatment of scoliosis that could successfully

Table 2. The initial correction of the braces as a function of the level of apex

Apex	Boston Thoracic Brace		%	Milwaukee Brace		%	Statistical significance of the difference
	n	Correction degrees (Mean±S.D.)		*n*	Correction degrees (Mean±S.D.)		
D 7	2	8.0±1.4	28	9	0.1±4.9	0.3	n.s.
D 8	30	12.6±7.0	41	21	3.1±4.6	9	$P<0.001$
D 9	15	15.0±5.7	50	13	2.6±6.1	9	$P<0.001$
D 10	7	18.3±7.3	55	6	6.5±5.7	17	$P<0.01$
D 11	1	21	54	5	9.4±7.9	25	n.s.
D 12	3	18.0±5.2	53	5	6.4±5.8	21	$P<0.05$
L	13	11.3±4.2	36	16	5.8±5.4	16	$P<0.01$
L 2	17	12.2±6.3	34	12	1.3±5.8	4	$P<0.001$
L 3	3	19.7±1.2	66	4	2.7±1.8	9	$P<0.001$
Total	91	12.9±6.4	41	91	3.6±5.8	10	$P<0.001$

Table 3. Initial correction of the braces as function of magnitude of the scoliosis

Initial curve degrees	Boston Thoracic Brace		%	Milwaukee Brace		%
	n	Correction degrees (Mean±S.D.)		*n*	Correction degrees (Mean±S.D.)	
18–20	3	5.3±1.2	28	1	1	5
21–25	13	10.0±6.8	43	10	2.9±6.0	13
26–30	29	13.2±5.2	47	19	3.4±5.9	12
31–35	29	13.2±6.2	40	26	3.4±5.7	11
36–40	11	16.1±7.9	44	12	4.4±4.0	12
41–45	6	14.8±7.9	34	9	4.3±5.6	10
46–50				14	4.4±7.2	9

abort progression of the scoliosis (Blount 1973). It is still the current world standard with which other brace treatments should be compared. The final result of the brace treatment should ideally include the entire life-span of the patient. A minimum requirement should be patient follow-up at least 5 years after skeletal maturity and end of brace treatment. Such results are only available for the Milwaukee Brace treatment (Blount 1973, Mellencamp et al. 1977, Salanova 1975, 1977). However, there is a good correlation between the initial correction in brace and the end result, better than between the correction in supine position and the end result (Nordwall 1973). Thus, it is reasonable to suggest that a brace that gives better initial correction is superior.

There are biomechanical and other studies that support the view that the superstructure of the Milwaukee Brace can be excluded without any significant loss of the correction (Galante et al. 1970, Nachemson & Elfström 1971). Andriacchi et al. (1976) showed in a biomechanical study that in small scolioses aimed for brace treatment, the traction of the neck ring contributed to a small part of the amount of correction only and that the three-point corrective force was of more importance. Furthermore, Lindh (1980) showed that flexion of the lumbar spine also caused a correction of the thoracic scoliosis. In an unpublished investigation we found that lumbar flexion per se caused a correction of the scolioses similar to that of the Milwaukee Brace and we believe that the lumbar flexion together with the derotational pads contributes to the good correction with the Boston Thoracic Brace.

In our hands the initial correction of the Boston Thoracic Brace was four-fold better than that of the Milwaukee Brace and equal to that of the Boston group (Watts et al. 1977). Our two groups treated with Boston Thoracic Braces and Milwaukee Braces, respectively, are not quite comparable. However, the small differences concerning mean age, sex distribution, magnitude of the curve or proportion of double curves do not alter the conclusions, because the Boston Thoracic Brace shows better correction in all sizes of curves and in curves with different apex.

The initial correction achieved with the Milwaukee Brace was small (mean 3.6°; 10 per cent), somewhat less than that reported by Nordwall (1973) who had a mean correction of 7°. Mellencamp et al. (1977) in a selected group of patients (scoliosis < 39° and cases not responding to brace treatment excluded) achieved an initial mean correction of 10°. Compared with this, as well, the Boston Thoracic Brace is superior.

The final results are not available and the patients have to be followed-up at least some years before it may be stated that the Boston Thoracic Brace treatment is equal or superior to the Milwaukee Brace treatment, but these initial results justify a continued treatment with Thoracic Boston Brace, since it is cheaper and, in our hands, is better tolerated by the patients.

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