

The Milwaukee Brace in the Treatment of the Young Child with Scoliosis

By

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With 8 Figures in the Text

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The great volume of scolioses that are being treated successfully with the Milwaukee brace without operation are the progressive adolescent curves. The most urgent need for the Milwaukee brace is in the young child with any type of progressive spinal curvature. Some children with paralytic scolioses have been supported with spines straight until they regained muscle power and were weaned



Fig. 1. K. W., age 3 years, 10 months, was jackknifed in an automobile accident. On July 1, 1955 there was significant anterior but minimal lateral compression of three of the upper thoracic vertebrae. The spine remained straight in the anteroposterior view during the 3 month period of treatment of the fractures shown in figure 2

* Dedicated to Prof. Dr. M. HACKENBROCH at his 70th birthday.

from their braces before puberty (BLOUNT et al.). Others were so severely paralysed that the braces sufficed only to maintain acceptable alignment of the spine until the children grew to a reasonable height. The collapsing spines were then fused. Infantile, left convex, idiopathic scolioses in little boys have responded well to brace treatment. They are seen in America rarely, but JAMES said that he used the brace routinely with better results than with any previous treatment.

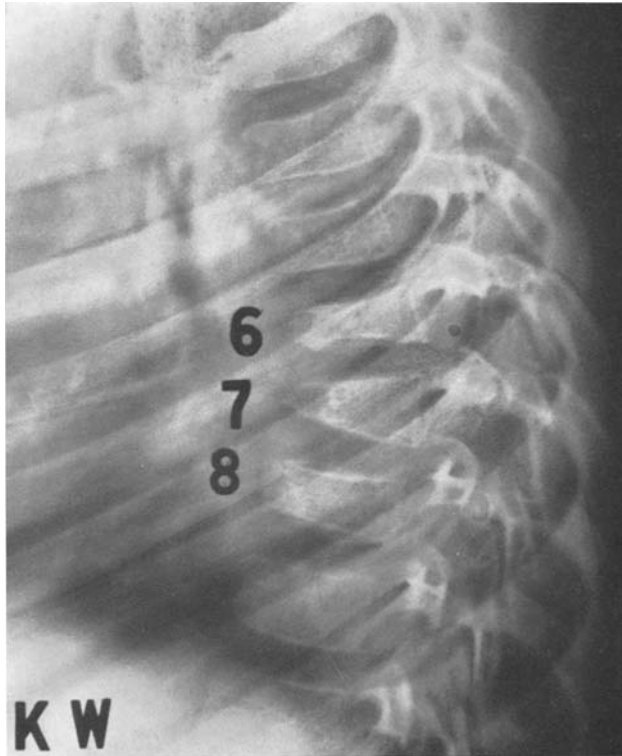


Fig. 2. K. W. A later film showing compression of T 6, 7, and 8. There were likely other injuries of the spine but the patient's posture and spinal motions were normal at 2 months and at 3 months

The more frequent right convex idiopathic curves in children under eight need no longer be fused in panic. If they are started on the brace treatment early they may be kept straight and the patient weaned before adolescence. Even if associated with Marfan's or von Recklinghausen's disease, the well developed curves can be improved and held until growth is nearly complete, before an operation is necessary. A shorter fusion is frequently possible because of the previous brace treatment. Young children with post-traumatic scolioses (Figs. 1—8) have been held corrected for several years, or until the spines were completely straight. Fusions have been postponed or eliminated entirely.

Mechanism of Correction

The efficiency of the Milwaukee brace depends on the alternation of forces of passive distraction and active derotation with active distraction and passive

derotation. Passive distraction includes the lift of a comfortable but inconspicuous flat chin rest and a notched occipital pad opposed by a sharply molded pelvic girdle. Stretching must never be so forceful that the patient cannot raise her chin and occiput from their pads while the brace is forced down against the hips. Active distraction requires her to push against the torso pads which must be

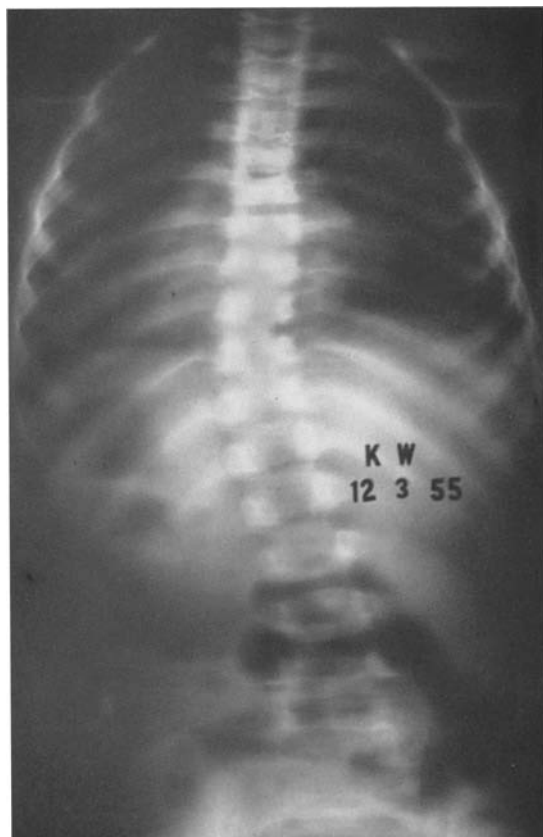


Fig. 3. K. W. 5 months after the accident she returned with a left thoracic curve with rotation. At her age such a scoliosis is alarming. A model was made for a Milwaukee brace and a Risser localizer cast applied

advanced far enough to give adequate support while she raises her head. Distraction is easier in the supine position.

Passive derotation is caused by the major pad (Fig. 4) pressing on the rib hump at and below the apex of the thoracic curve. In this pressure there is a component of medially directed force that reduces the lateral curve. Active derotation is accomplished by the patient when she moves her torso away from the pressure pad so that the examiner's entire hand may be slipped between it and the torso. This is possible only if there is efficient passive distraction.

Fitting the Brace

The neck ring is left elongated at first. The pelvic girdle is tight but the brace is extended to less than the maximum. Pressure pads are applied snugly but not

forcefully enough to cause discomfort. The patient feels no constriction or excessive pressure. Until she is comfortable and well adjusted, she should be seen by the orthopaedic surgeon daily.

The brace is lengthened and the pads are advanced on the second or third day. Standing x-rays are made to check the level of the pads and the degree of correction (Fig. 5). Additional x-rays need not be made oftener than every two or three months and later, every six months.

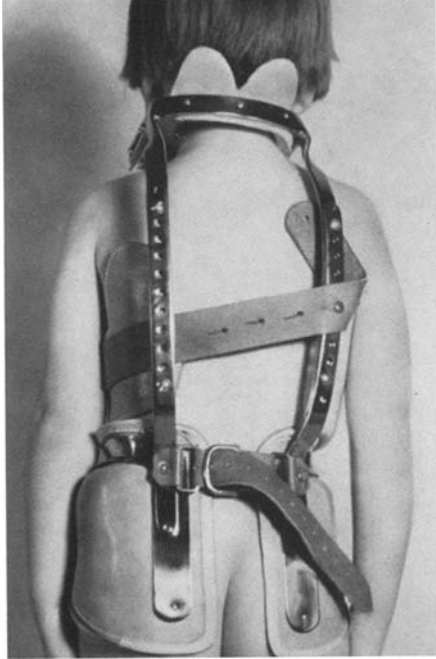


Fig. 4. K.W. The Milwaukee brace was substituted for the cast after 1 month and worn for a total of 5 years. The pelvic girdle was replaced once

The pelvic girdle must be snug at the start, but it can be tightened more in twenty-four hours and frequently thereafter. With correction of deformity, developmental narrowing of the waist and loss of fat, the girdle may be drawn in until the vertical edges overlap.

If it is too loose, the brace rides down over the ilia and makes painful pressure against their sharp lateral margins, worse on the side opposite the major pad. If the patient complains of pressure on the ilia, the girdle is too loose, not too tight. This paradox must be carefully explained to the parents. Tightening the properly contoured girdle forces it upward and distributes the pressure over a larger area that is better padded with soft tissues. Raising the girdle distracts the torso, and has the effect of lengthening the brace.

Exercises

The child's activity should be maintained at nearly normal level in the brace. Vigorous games such as volley ball, tennis, and bicycle riding are encouraged. Some children actually excel in sports but body contact games are forbidden because of the danger to the other players. Patients need not be excused from physical education at school if the authorities will insist on only the parts of the program that are acceptable. Posture exercises may be included or substituted.

Swimming is an excellent sport. The child is permitted to remove the brace for an hour if she can be trusted not to sit around the pool without it. When not swimming she must lie down. In the summer, daily swims are permitted but the brace must be worn to and from the poolside. If she has no opportunity to swim it is expedient to remove the brace as often as once a day for bathing and care of the skin at pressure points.

Breathing exercises should be taught the child and the parents. These are most important in correcting the thoracic lordosis and the rib hump. As the child inhales deeply and forces her back against the major pad, the torso can be seen to derotate. The properly constructed brace corrects the posture but posture exercises

in the brace including "sit-ups", are desirable to maintain muscle tone. A physical therapist is a great help during the first week and at regular intervals thereafter.

The uprights should form a loose cage and should not be fitted closely to the torso. The patient must be able to inhale deeply and force the spine backward or shift the torso into the overcorrected position without touching an upright. The bars may be bent out in back if necessary.

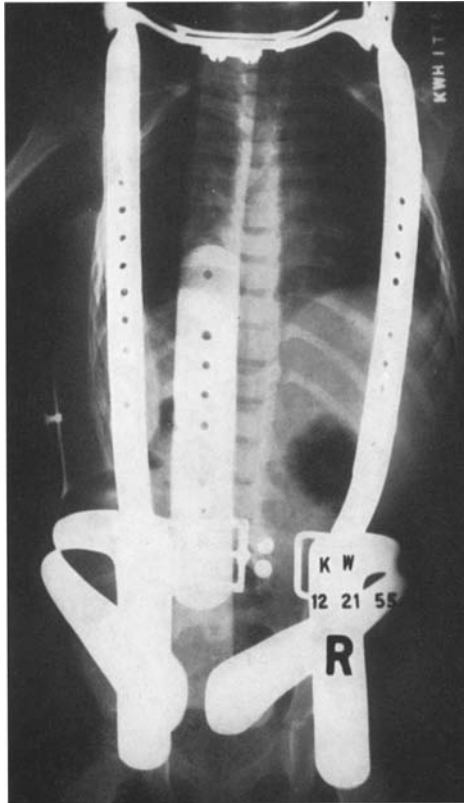


Fig. 5. K. W. An x-ray taken through the brace shows overcorrection of the left convex curve by distraction and lateral pressure. The pad can be seen on the left

As the correction of the deformity progresses, other adjustments of the brace will be needed. Most important is the increase in the pelvic tilt by bending the uprights and adjusting their length. The angle of the neck ring should not be changed after the initial adjustment. It is rarely advisable to lengthen the brace in back without also elongating it in front. A common error is to extend the brace too much, and then expand the neck ring from back to front so that the patient can sit. This is vicious because it lets the occipital pad slip up behind the head. The function of the accurately contoured occipital pad is to support the head, not to push it forward. The remedy is to shorten the brace and the neck ring at the same time.

Significant jaw deformities have not been observed unless a vicious cup shaped chin rest is used. Excessive pressure must be relieved by the orthotist. If the

temperomandibular joints ache or the patient has pain anywhere else, she should lie down. She should have one, or preferably two, one hour rest periods in a recumbent position daily. The brace is more efficient with the patient supine.

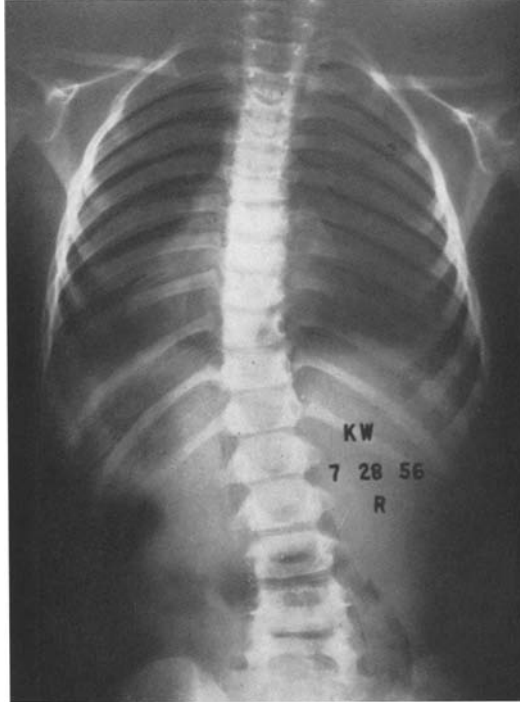


Fig. 6. K. W. 1 year after the accident, a standing x-ray without the brace showed persistence of the structural curve. There appeared to be wedging of T 9 and 10. The brace was continued full time

All patients should have an orthodontic examination before starting treatment. A significant number of them develop protruding incisors after a year or two. At the first sign of this deformity, a retaining apparatus should be used or positioners worn at night.

Weaning

The brace is worn full time until the curvature reaches its maximum correction, and shows no tendency to regression when support is removed briefly. This means that an adolescent must be kept in it constantly until the skeleton is mature by all available criteria; that a young child wears it until he has grown straight.

Weaning must be gradual after the corrected spine is stable. Sudden removal of support may cause loss of correction. A standing x-ray is taken after the child has been out of the brace three hours. If there is no loss of correction, the brace is removed for three hours once a week; then twice a week. More days are added until the patient has a three hour free interval daily. The time out of the brace is next increased. If the spine is still straight in a standing x-ray taken after six hours without the brace, the free time is increased to six hours once a week, then twice a week, and so on. When the child can be out of the brace eight hours without

loss of correction she may attend school without it, at first one day a week and gradually oftener. It is worn at night only, for the last six months or even longer.

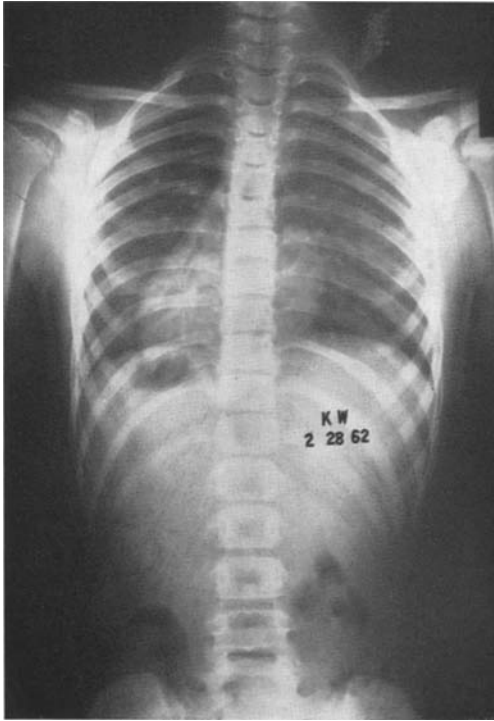


Fig. 7

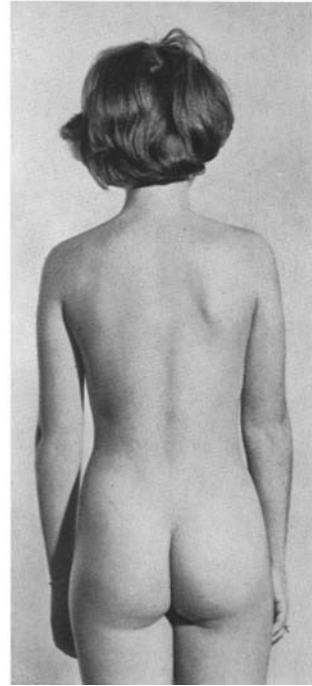


Fig. 8

Fig. 7. K. W. 5 years after the accident the spine was finally straight in a standing x-ray. The brace had been off all day. The patient wore it for another 6 months at night only. This film was taken after 6 ½ years. Fig. 8. K. W. Here the child is 11 years old. Her spine is straight clinically and in the roentgenogram. There are no symptoms nor positive findings other than in the lateral x-ray. There was no recurrence on a follow-up a year later

Summary

If the young patient is seen early, an adequate Milwaukee brace is supplied promptly and fitted carefully, and if adjustments are carried out under the supervision of the orthopaedic surgeon at intervals of two to three months, gratifying correction will be obtained in some curves that previously defied nonoperative treatment (BLOUNT 1963). If the correction is maintained until the spine has been stable and straight or nearly straight for a year or more, there will be little, if any, loss of correction when the patient is slowly weaned (BLOUNT Acta).

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