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A New Cervical Neck Ring for the Idiopathic Scoliosis C.T.L.S.O.

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The Milwaukee orthosis has been used in the treatment of scoliosis since 1946.[1] Originally designed for post-operative spinal management, this orthosis has since developed into one of the best non-operative management methods used to manage the progression of a scoliotic curve (Figure 1). The C.T.L.S.O. has been used successfully in the management of juvenile idiopathic scoliosis, infantile idiopathic scoliosis, congenital scoliosis and kyphosis.

Figure 1. Original Milwaukee Brace, ca. 1945.

Figure 2. Contemporary Milwaukee.

There have been many improvements to the orthosis since its inception, as new materials and diagnostic procedures have become available to the orthotist. These improvements have helped create an orthosis which, compared to the original

orthosis, is more comfortable, easier to don and doff, easier to clean, and is more cosmetically acceptable to the patient (Figure 2).

SCOLIOSIS POPULATION

The incidence of idiopathic scoliosis as reported in a 1978 study by Rogala[2] was 4.5 percent for a scoliotic curve of more than five degrees and two percent for a curve over ten degrees. Of this population, 6.8 percent exhibited a progression of five degrees or more leading to a range of 20 degrees of curvature or more. Of these, 95 percent were treated with braces, and in all but 2.6 percent, the treatment was successful. From these figures it is probably safe to say that for progressive structural curves of more than 15 degrees, a brace is indicated. Once a curve has reached 40-45 degrees, surgical corrections are likely to be necessary, except in some well-compensated double curves, when up to 60 degrees may be corrected with an orthosis.

RESEARCH AND DEVELOPMENT

Our first attempts to improve the cosmesis of the C.T.L.S.O. neck ring were prompted by Dr. E.E. Bleck, professor and executive head of the Division of Orthopedics, Stanford University School of Medicine, who requested an innovative and highly cosmetic neck ring design which would give lateral control of the cervical region. The original Milwaukee neck ring provided a large longitudinal distraction force which can only be applied at the risk of damage to the growing bones of the mandible and maxilla, creating orthodontic problems. Because of this, the concept of forceful longitudinal distraction has been abandoned and the concept of a three point pressure system, with optional mild mandibular distraction, has been adopted. The use of a lateral three point pressure system, provided by a thoracic pad below the apex of the major curve, resisted by an incapsulating pelvic girdle below and the neck ring above, has proven successful. The use of such optional fitting elements as a lumbar pad to create additional three point pressure has oftentimes proven necessary.

There is no doubt that the management of scoliosis with the C.T.L.S.O. for a period of several years is often emotionally traumatic for a teenager to face. To minimize this, constant efforts must be made to reduce the stress on the patient in terms of weight, function, and cosmesis. Since the majority of patients are adolescent girls, the aesthetic quality of the brace can make a significant difference in the patient's acceptance of the brace. It is in keeping with this effort that our first modified neck ring was constructed (Figure 3).

Figure 3. First modified neck ring.

Designed to fit Durr-Fillauer prefabricated components, the modifications to the neck ring eliminated the entire anterior portion of the conventional throat mold neck ring, including the hinge system. A new hinge system was designed and constructed which, by using the anterior mounting plate as the attachment device and hinge, afforded a more unobtrusive and cosmetic anterior section. This accomplished, the posterior section was modified by removing the upright attachment tabs and attaching the posterior superstructure uprights directly to the posterior segment of the neck ring. Some of the bulk of the neck ring was thus reduced,

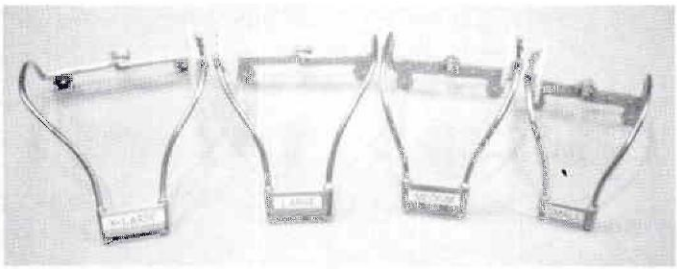

Figure 4. Durr-Fillauer low profile neck ring.

creating a closer fitting and more cosmetic posterior section.

This modified neck ring design was used on eighteen C.T.L.S.O. patients with overwhelming patient, parent, and doctor acceptance. The patients liked the new design so much that three veteran C.T.L.S.O. wearers, having seen the new design, insisted on having their orthoses converted to include the new neck ring.

The time involved in the fabrication of the modified neck ring (averaging four to six hours each) prompted the inquiry to the Durr-Fillauer Company, regarding their consideration in manufacturing the modified neck ring. A prototype neck ring was sent to their new products department, providing the impetus for the second low profile design. This cervical neck ring uses the concept of the combined anterior mounting plate and hinge, and carries the concept one step further by extending the stainless steel rods within close proximity of the lateral borders of the neck, curving over the shoulders to a knurled knob closure in the proximity of the C7 vertebra (Figure 4). This further enhances the cosmesis of the neck ring and keeps the closure away from the posterior inferior hairline, reducing the problem of catching hair

Figure 5-A. Patient in orthosis with low profile neck ring, shirt on.

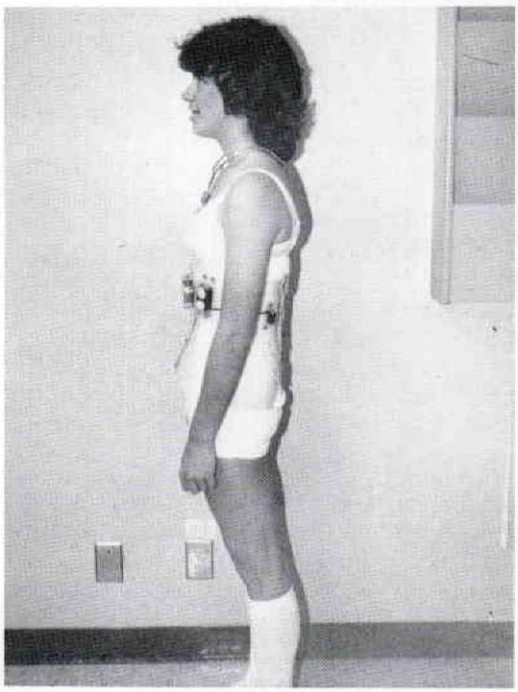

Figure 5-B. Patient in orthosis with low profile neck ring, shirt off.

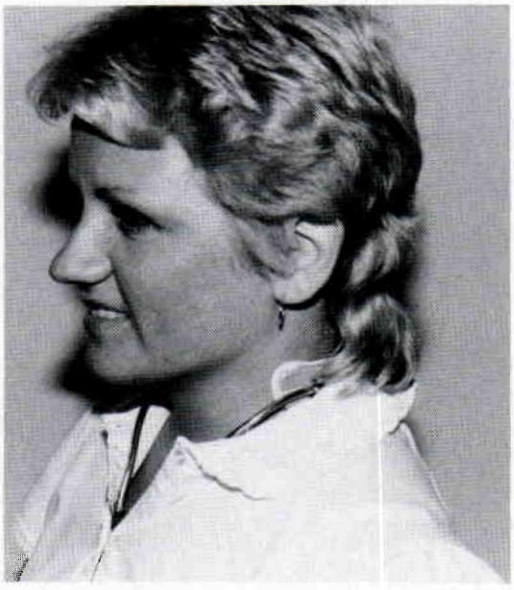

Figure 6. Close-up showing lateral pad.

Figure 7. Close-up of patient with low profile neck ring and mandibular support.

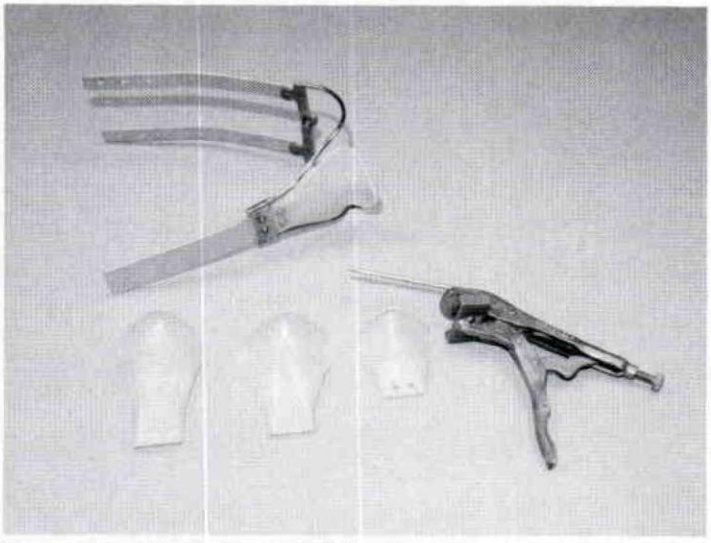

Figure 8. Mandibular support and forming tool.

in the neck ring upon closure (Figure 5-A, 5-B). This second design is probably the most cosmetic and functional to date.

In its initial clinical evaluations, Durr-Fillauer has experienced the same measure of positive response that we did. Moreover, the impression exists that more C.T.L.S.O.'s are being prescribed than before. The supposition is that with the superior cosmesis afforded by the low profile neck ring versus the traditional neck ring, the physician is prescribing the C.T.L.S.O., instead of the T.L.S.O., for borderline patients.

In addition to the modified neck ring, Durr-Fillauer has also developed a mandib-

ular support of subortholen (Figure 6). Their intention with this support is that it can be used in an initial fitting to remind the patient to maintain correct posture. Subsequently, after the first month or so, when proper habits have been established, it may be removed. This would seem to be particularly useful in treating kyphosis. The subortholen mandibular support is molded in one size and trimmed to the proper length. A special tool is used to form the channel in the inferior portion of the support and doubles as a drill guide for the attachment holes (Figure 7).

SUMMARY

The orthotic staff at Children's Hospital at Stanford, with help from Carlton Fillauer, C.P.O. and Karl Fillauer, C.P.O. has developed, tested, and evaluated a new cervical neck ring for use on the C.T.L.S.O. The neck ring provides lateral cervical correction, low visibility, and correspondingly better cosmesis.

REFERENCES

[1]Blount, W.P., Moe, J.H., *The Milwaukee Brace*. Second Edition. The Williams & Wilkins Company, 1980.

[2]Rogala, E.J., Drummond, D.S., Gurr, J., "Scoliosis: Incidence and Natural History," *Journal of Bone and Joint Surgery*, 60-A, No. 2, March, 1978.

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AUTHOR

Greg Moore, R.T. (O), at the time of the article, was a staff member at Stanford Children's Hospital.