

A SPRING-LOADED LOW BACK BRACE

A Preliminary Report

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All of the low back braces available today are fabricated to provide anteriorly or posteriorly directed forces. None accomplishes satisfactory immobilization, and, in fact, braces with a high thoraco-lumbar purchase area increase lumbosacral motion (1). Attempts to improve the lumbar immobilization by applying increased abdominal pressure are useful to a limited degree, as in the Williams brace, but the use of this technique as an ultimate goal raises problems of more remote secondary effects on the cardiac and respiratory systems (2).

The spring-loaded back brace (Fig. 1) was conceived to employ concepts that were presented at a recent Spinal Orthotics Conference:

1. "The critical buckling load of a semi-flexible rod is dramatically changed as one imposes variations in the end-point conditions of the rod. Milwaukee braces probably do this" (2).

2. With reference to present braces, Keagy (2) stated "it is incorrect to impute to the brace the ability to 'hold you up' as if it acted as a structural prop. This type of action implies that there is, in the patient, the capacity to avoid or withdraw, that the brace can 'induce' a physiologic neuromuscular response of modified behavior or position."

The brace described here was designed to impose "end-point" variations and provide a stimulus to withdrawal. These features were accomplished by fabricating a broad transverse proximal molded plastic band of Orthoplast so that it was fitted to conform to, and curve under, the lower rib cage in the manner of a hemipelvectomy socket. The distal molded transverse plastic band was fitted over the pelvis and iliac crests (Fig. 2a and 2b). Both were joined by two spring-loaded supports. By pushing down on the uprights the patient compresses the springs and loads the brace. The Velcro straps are employed to retain the loading

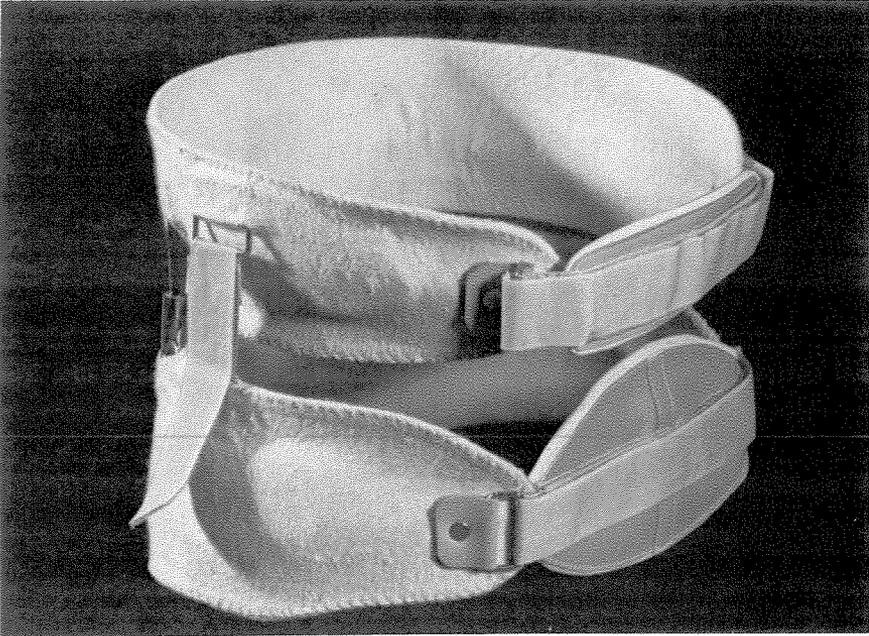


FIGURE 1.—The finished brace has been provided with a cosmetic cover.

(Fig. 3a). Following application of the brace the Velcro straps are opened and the compressed springs are released. We found $\frac{3}{8}$ in. separation adequate (Fig. 3b). This can be readily varied by changing the springs. The spring-induced upward pressure on the rib cage was conceived to provide a Milwaukee brace type of stimulus to withdrawal. It is also to be observed that the brace hugs the body well (Fig. 4).

A patient, M. L., a lawyer, was chosen to wear the brace because he had had unrelieved low back pain since World War II. Surgery was not desired and the patient has been treated conservatively. Some of the treatment can be briefly summarized as periods of absolute bed rest, physiotherapy, antispasmodics, analgesics, sedation, trigger point injections (novocaine and hydrocortisone), Knight-spinal braces, reinforced fabric-type lumbosacral back supports, and a laced removable plaster jacket. The pain has persisted with frequent acute flareups superimposed on a constant base of pain. Numbness in the L₅-S₁ distribution has been constant as have a shift of the trunk, lumbar paraspinal muscle spasms, limitation of trunk motion, and a positive left Lasègue.

The patient's initial response to this brace was so enthusiastic as to prompt this preliminary report. He has volunteered the information that this is the best back support he has ever had. In recent years he has had to stop half-a-dozen times to rest when walking the four city blocks

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to his office. Since wearing the spring-loaded support for approximately 1 month, he has only had to stop once.

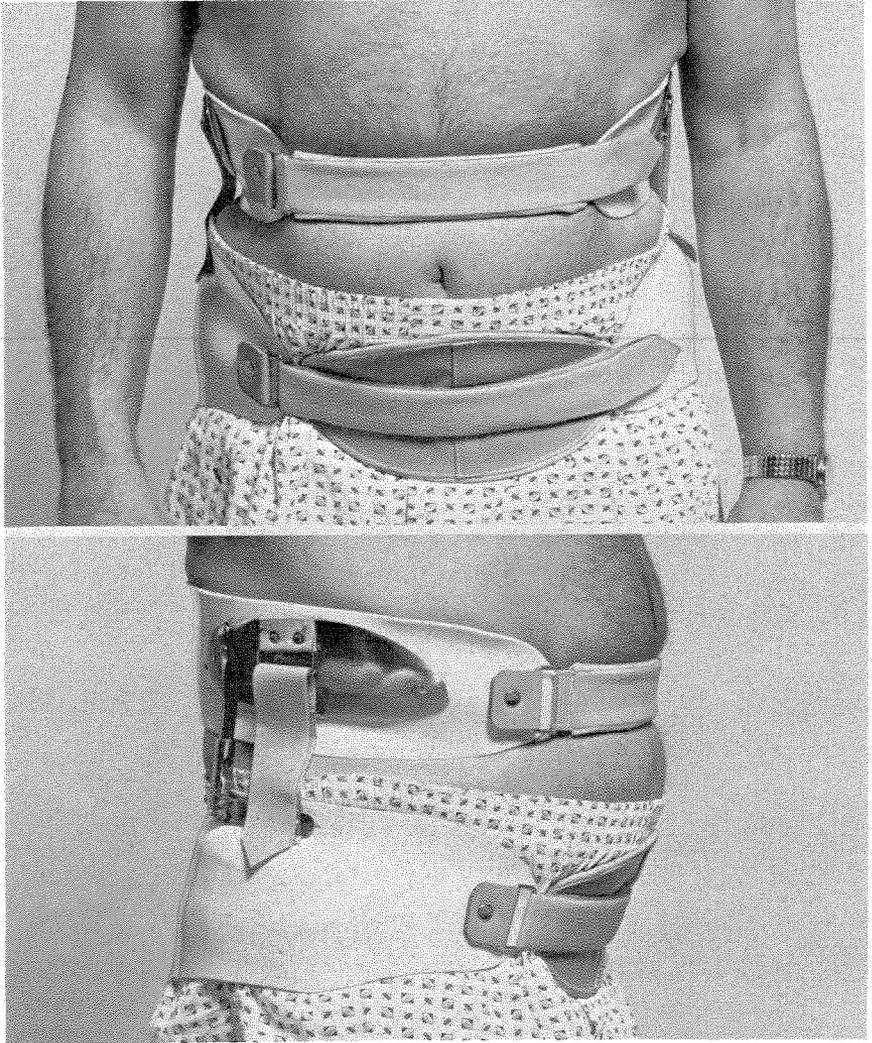


FIGURE 2.—Note the manner in which the brace is molded to the pelvis and beneath the rib cage.

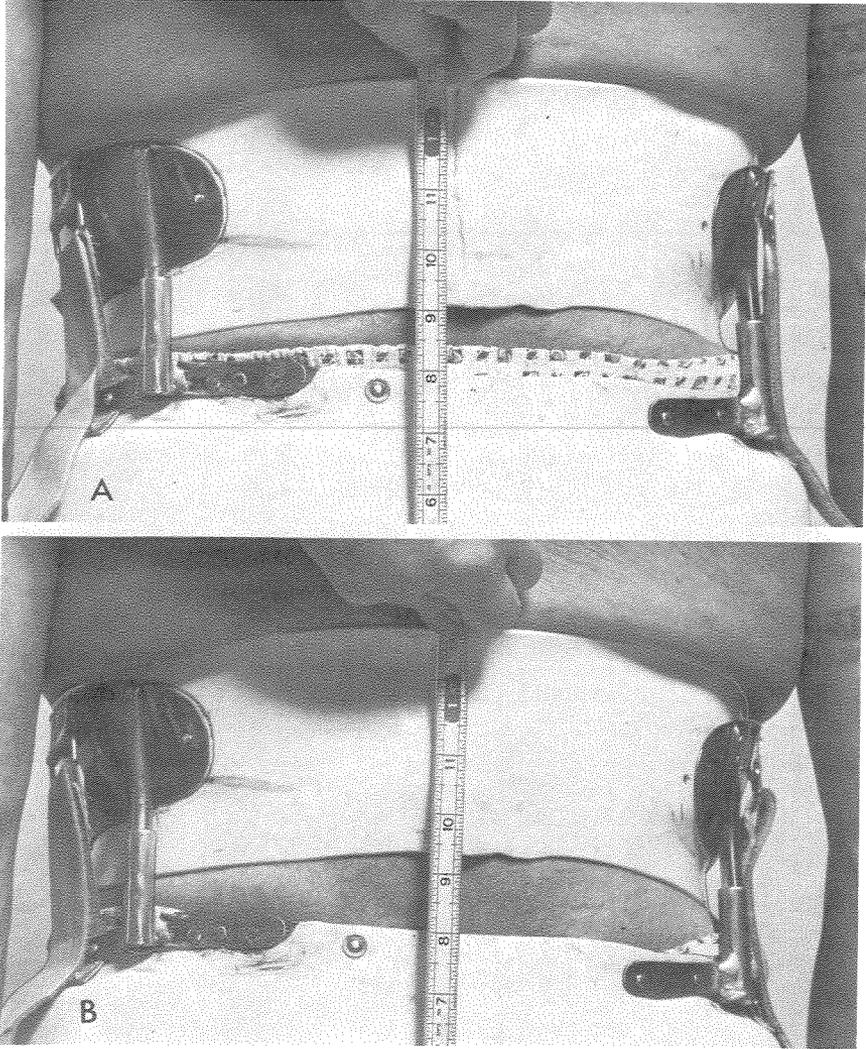


FIGURE 3.—a. The brace has been loaded and applied, b. the brace has been unloaded.

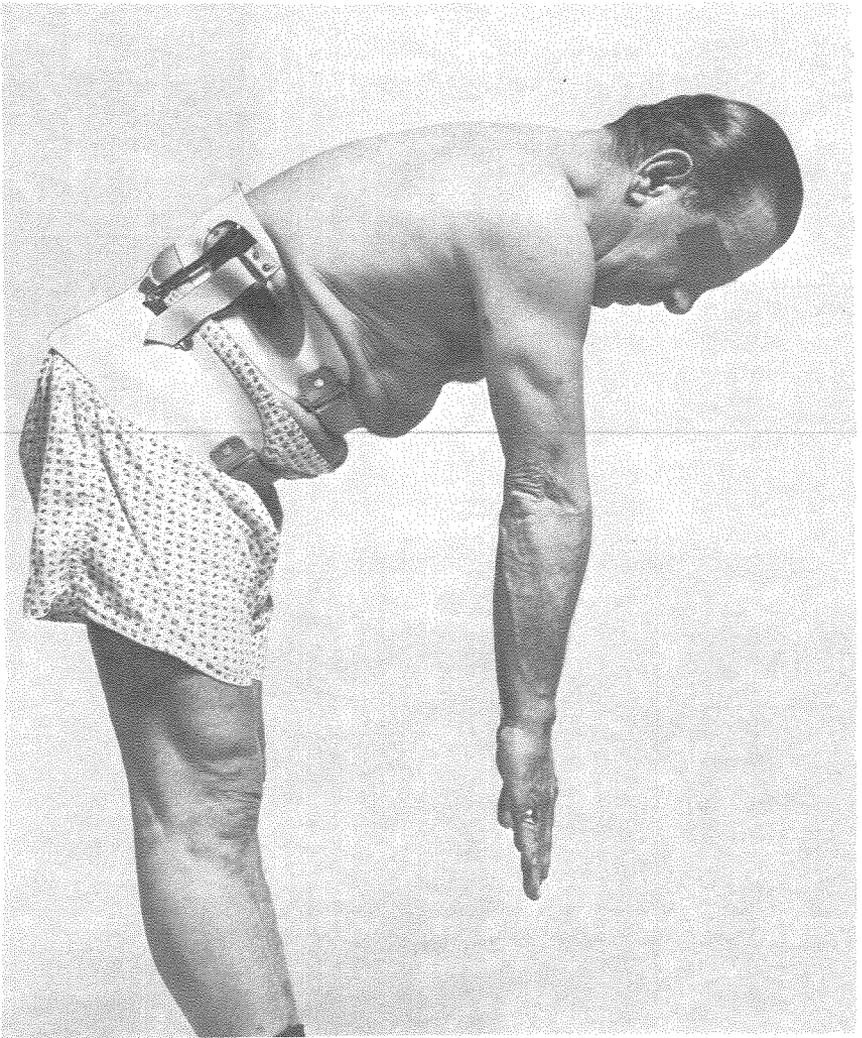


FIGURE 4.—Patient flexing to his maximum range. Note brace-body relationship. The brace should normally be worn over an undershirt and beneath undershorts.

SUMMARY

A low back brace has been designed which, besides retaining the principles of anteriorly and posteriorly directed forces, adds two new features to braces for this area, i.e., improved purchase at both ends of the brace, and spring-loading to provide a withdrawal stimulus somewhat similar to that of the Milwaukee brace.

REFERENCES

1. Spinal Orthotics: A Report of a Workshop Sponsored by the Committee on Prosthetics Research and Development of the Division of Engineering, National Research Council, National Academy of Sciences, Washington, D.C., 1970, Thornton Brown: Bracing for Low Back Pain, pp. 75-84.
2. Ibid., Robert O. Keagy: Principles of Bracing for Pathologic Conditions of the Spine, pp. 25-30.