

# What We Are Trying To Brace In Cerebral Palsy

By ROBERT P. KEISER, M.D.

*Coral Gables, Florida*

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Cerebral Palsy is one of the most common among the neuromuscular disorders, which for its successful management, requires the skill, knowledge, and coordination of many people, not the least among whom are the Orthopedist and the Orthotist.

Historically, this condition was first described by a London Physician, Dr. William John Little, just one hundred years ago in 1861. Sir William Osler in 1889, first used the term, "Cerebral Palsy," but subsequently, for many years, variable terms were used to describe the condition, which was limited in scope and not too well understood as we understand it today. In relatively recent years, Dr. Winthrop Phelps and others have more or less standardized this term as an all inclusive description of the multiple complexities involved in this disease.

It is interesting to note how emphasis changes over periods of time in the various diseases of mankind. Cerebral Palsy has been known and treated for many years, but until the era of sulfa drugs and antibiotics, the great medical effort was directed toward the treatment of acute diseases of childhood and relatively little attention was paid to the chronic, disabling, conditions. These children so afflicted were kept out of sight, regarded as a mistake or an unfortunate incident somewhere along the line, and for the most part were cast aside. Today, and for the past fifteen years or so, an all-out care program is in effect as well as research as to the cause of Cerebral Palsy and its various types, new approaches to the associated deafness, blindness, speech impairment, mental deficiency, education potentialities, etc., etc., etc.

Today, then, we are facing the problem which affects, according to various statistics in different areas of the world, from one to three children and their parents, out of every one-thousand births.

What is Cerebral Palsy? The American Academy of Cerebral Palsy has defined it as "any abnormal alteration of movement or motor function arising from defects, injury, or disease of the nervous tissues contained within the cranial cavity." A more simple, concise, definition would be "A Neuromuscular Impairment of Cerebral Origin."

Before we can treat these individuals by bracing or any other type of therapy, we should know with which of the various types of Cerebral Palsy we are dealing. There are five main categories.

1. SPASTIC—This is the most common; may affect one or all four of the extremities and the trunk. These are described as Monoplegic, Quadriplegic, Paraplegic and Hemiplegic.

2. **ATHETOSIS**—This is next most common of the Cerebral Palsies and may be described as those having uncontrolled, involuntary, somewhat purposeless movements of the trunk and extremities. They may present a certain amount of increased muscle tension, but do not have the Hyper-Reflexia or the Pathological Reflexes associated with Spastics.

3. **ATAXIA**—This is best described as merely an unsteadiness of gait and balance.

4. **TREMORS**—Rapid repeated Rhythmic Tremor involving the entire body or any of its parts.

5. **RIGIDITY**—These are manifest by general resistance to movement of joints or parts in any direction. One gets the feeling of bending a lead pipe when attempting to passively move the extremities.

Over a period of years the pendulum of medical opinion regarding bracing in Cerebral Palsy has swung from the opinion of those who feel that no bracing is indicated to the other extreme of over-bracing and depending on braces too much and for too long a time. There are still those who advocate one extreme or the other. However, most men associated with this condition feel that bracing does play a very integral and important part in the treatment program.

We feel that bracing plays an essential role in the treatment of these children and would find it almost impossible to effectively manage them without it.

We must realize that in Cerebral Palsy we are confronted with weak muscles as well as spastic or overly strong muscles. The weakness is due to flaccidity, central in origin, or to weakness from disuse and/or the long term, overpowering reaction of their antagonists.

There are five main objectives toward which we are striving by the use of braces in Cerebral Palsy:

1. To reinforce a certain joint or joints which are unstable for weight bearing or use, because of weak controlling muscles or an over-pull of strong muscles or a combination of both—Spastic.

2. To stabilize or control certain joints or parts for the training of others, or to assist balance either in standing, sitting, or walking—Athetoid.

3. To prevent deformity—Spastics and some of the Rigidities.

4. To assist in correcting deformity—we feel that very few braces can successfully correct deformity of any degree, and particularly in the spastics where they commonly develop. More will be said about this later.

5. To maintain correction of deformity after it has been overcome by other means, i. e., surgery or plaster casts.

Another category which we might add in our objectives are those severe, virtually untreatable cases from every viewpoint, for which there are braces to convert an unmanageable mass of protoplasm to some semblance of shape and stability, thus making the everyday care of such an individual a little easier. This particular objective combines several of those previously outlined.

In general, as all of you know, braces for use in Cerebral Palsy must be of heavier construction and be more durable, particularly at the joints, than comparable braces in Poliomyelitis, for instance.

To enlarge on our previous statement regarding the correction of deformities with braces, it has been our experience that fixed deformity of any degree, or deformities associated with severe spasm, cannot be handled adequately with braces. Despite adjustable knee lock hinges or graduated ankle stops, patients cannot tolerate the more or less localized pressure areas



of bracing for sufficiently long periods to afford correction. This is particularly true at the knee. In the equinus deformities of the feet, shoes of any type do not have an adequate hold or sufficient surface coverage to keep them from slipping. This results either in no benefit or the development of pressure ulcers, particularly on the heels. It is much more efficient and generally more satisfactory in such instances to correct the deformity by casts, or in selected cases by surgery; then utilize bracing to maintain correction, and as a mechanical assist, for stabilization and training purposes.

At what age do we start using braces? The simple answer, of course, is at whatever age they are needed. The need varies in each individual case and depends to a degree on how much retardation and damage exists elsewhere, other than simply the motor center. There is no value in bracing an infant who hasn't attained sufficient developmental maturity to make any attempt to sit, let alone walk. When they have reached a level where they make the effort but can't, then simple bracing will assist in the development of muscle control to accomplish the desired end. The same holds true for standing and walking. Although the pressure from parents will be great to "do something," it is a waste of time, energy, and money to attempt the impossible. We must have *something* to work with before we can assist it. These parents should be impressed that they have a long, hard, potentially expensive road ahead and must adjust themselves accordingly.

In regard to specific types of braces, lower extremity, upper extremity, trunk, etc., I am not going to recommend or advocate any name type or go into any particular construction detail. Each physician who is informed and handles these cases has his own preference, and each brace man utilizes his own techniques of construction. It is essential, however, that the appliance as applied to and used by the child be the result of the close cooperation and the complementary thinking and knowledge of the physician and the orthotist to accomplish the purpose or purposes for which it is constructed. This requires a certain amount of knowledge on the part of both, of each other's art, and a willingness to consult freely with each other from the time the prescription is written until proper fitting and all adjustments have been made, to accomplish the desired end result.

In general, with the spastics and athetoids, upper extremity bracing has many shortcomings and in most instances is not too practical. The usual attitude of elbow flexion, wrist and finger flexion with forearm pronation, just does not lend itself well to bracing, except for part time use during training periods, or as a night appliance to prevent impending fixed deformities. Most children learn to use their assistive hand, (and that is all it is, even at best) better without than with a brace. They are for the most part cumbersome, unsightly, require assistance in their application, and the children and parents simply refuse to use them consistently.

In the lower extremity, double bar braces with few exceptions are necessary to provide sufficient control. Static stops at the ankle are more effective than the spring type in most cases, because the spring is apt to trigger the stretch reflex, particularly of the calf musculature, and the heel simply pulls out of the shoe, even though the shoe may be of the high top type.

In the case of severe spastic equinus a short leg brace is inadequate and the knee must be included in the bracing to effect adequate control of the foot.

With the long leg brace, the ring or slip lock seems most desirable at

the knee, with or without an extension spring control, and must be bilateral because of the torsional stresses exerted at this level.

The problem at the hip level is usually one of adduction or scissoring, flexion of the hip and rotation at the hip, more commonly internal rotation or "toeing-in." All elements of the deformity vary considerably in degree in each individual case. Adequate control and satisfactory gait patterns can be attained in mild cases with long leg braces and either elastic or leather rotation control straps. In others, where more severe spasticity exists, and there is associated weakness of their opposing muscles, pelvic bands are necessary. The simple band may be altered in several ways to effect more stability. Gluteal reinforcement pads or straps can be added as the need arises. Interpositioning devices between the leg braces of various ballbearing and other control types are used to maintain an abducted position, taking more stress off the hip joints and still allowing the reciprocal forward and backward motion of the extremities for walking.

For those more severe cases of spasticity or athetosis with associated trunk and hip weaknesses, full bracing of the extremities and trunk are necessary. These are used not only for control purposes, but in athetoids particularly to eliminate the "Athetoid Shift" and to establish over a long period of time, muscle development according to a certain pattern of standing and walking, so that they eventually may eliminate their appliances. Athetoids very rarely develop any fixed deformity. This fact fortunately eliminates one of the problems in the treatment of these most difficult cases.

In summary, I would like to emphasize several points:

1. Bracing is an essential part in the successful treatment of the neuromuscular component of the disease complex known as Cerebral Palsy, in most instances except the mild forms of spastics, athetoids and rigidities. It is of practically no value in the ataxics or tremors.

2. It is just as wrong to over-brace and depend on bracing for too long a time as it is to under-brace or not brace at all when it is needed.

3. It is necessary that both the physician and the orthotist realize the limitations of bracing and not try to accomplish with appliances something that could be accomplished more efficiently and effectively by other means.

4. It behooves both the physician and the orthotist to analyze the problem and the goals to be attained before prescribing or constructing a brace.

5. The end result should reflect the combined efforts and knowledge of the two and should not just be a shiny piece of metal and leather into which a complete body or one of its parts is crammed for better or for worse.

6. It is not enough for the physician to know the etiology, manifestations and types of Cerebral Palsy. He must have some knowledge of mechanics and brace construction and their application to a patient. Neither is it enough for the orthotist to mechanically know the component parts of the braces and how they are put together. He must have some knowledge of anatomy, joint function, and its muscle control, the basic problems of Cerebral Palsy and how his appliances can be adapted and fitted to a human being. In other words, there must be a common ground where both can meet to discuss and evaluate the various aspects of the presenting problem.