

Should Functional Ambulation be A Goal for Paraplegic Persons?

Michael J. Quigley, C.P.O.¹

The goal of functional ambulation for paraplegic persons is a subject of long debate in virtually all rehabilitation settings. Such factors as lesion level, motivation, attitude of the clinic team, age, body build and occupation are important determinants when orthoses are prescribed for ambulatory purposes. Despite the various orthotic designs available, and the philosophies that accompany each design, the majority of paraplegic persons will either reject their orthoses or not have them prescribed.

Personal experiences and published reports indicate that when a thoracic level lesion is present, only about two percent of patients fitted will reach the level of household ambulation. There are many reasons for this, the main one being the excessive energy expenditure needed to ambulate in an orthosis. The donning procedure for most orthoses is difficult and time consuming, and once the orthoses are on the patient they often interfere with transfer activities. In addition, crutches are needed for stability while standing and ambulating, which limits the use of the hands and arms. Other problems with standing and ambulation for paraplegic patients are the lack of bladder control while standing and obviously abnormal walking pattern.

In this brief article, I will review some of the more pertinent articles on this subject, and then present my opinion concerning the provision of lower-limb orthoses for paraplegic persons.

The history of the orthotic treatment of paraplegia does not go back much further than World War II, since previous to that time about 90 percent of the spinal-cord-injured persons died from genitourinary infections. The development of antibiotics to combat these infections reversed the fatality rate shortly after World War II (4).

The physiological benefits of standing persons with paraplegia were first mentioned by Abramson (1) in 1948, who stated that an hour of standing each day will prevent osteoporosis in the lower limbs and helps to prevent urinary calculi and genitourinary infections. In 1964, Rusk (7), stated that "circulation and nutrition, as well as morale, are also aided by keeping the patient in the upright position for several hours each day".

Rusk also recommended that the tenth thoracic vertebra be used as a landmark when prescribing orthoses; lesions at or superior to this level are usually given double-bar long leg-braces with a pelvic band and Knight spinal attachment (current terminology is LSHKAFO, or lumbo-sacral-hip-knee-ankle foot orthosis); lesions inferior to T₁₀ level are prescribed the same orthoses without the spinal attachment, and lesions inferior to L₁ are fitted without a pelvic band.

Hahn (3) and Scott (9) from Craig Rehabilitation Hospital in Denver, Edberg (2) from Rancho Los Amigos Hospital in Downey, and Warren et. al., (11) from the University of Washington, do not advocate the use of the pelvic band on paraplegic patients. Edberg feels that the pelvic band must apply excessive pressure against the skin to be effective, that it causes difficulty in donning the orthosis, limits flexibility and adds excessive weight. Hahn and Scott state that the two most important considerations for orthotic design for paraplegics are ease of donning and control of ankle dorsiflexion, hence the so-called Craig-Scott design KAFO (Fig. 2) has no pelvic band, only one thigh band, and a fixed but adjustable ankle joint.

Hussey and Stauffer (5) studied the ambulatory function of 164 spinal-cord-injured patients at Rancho Los Amigos Hospital and stated that "no patient achieved any form of functional ambulation without pelvic

control* and there appeared to be no effective method of bracing patients to overcome this deficit". The nerve supply for the pelvic control muscles is affected by a thoracic lesion.

Rosman and Spira (7) reported similar problems in ambulating patients with thoracic lesions. In a study of 35 patients with lesions from the T₁ to T₁₁ level who were fitted with orthoses for ambulation, only one patient was ambulating out of the hospital, and five used the orthosis for standing only. The report concluded "that there is an essential difference between the 'occupation' of walking in the 'non-pressured' rehabilitation environment and walking when faced with the problems of everyday life". It further concludes that "some disabled persons with unusual strength, willpower, and motivation for walking will successfully overcome the difficulty, effort, and social strain involved in the continuous use of braces", but that "most will eventually relinquish these goals because the effort proves too great".

Pneumatic orthoses (Fig. 1) were developed and first used in the United States, amid great fanfare, in 1973. Three major evaluations by Silber (10), at New York's Bird S. Coler Hospital, Ragnarsson et. al., (6) at the Institute of Rehabilitation Medicine, New York University, and by the Committee on Prosthetics Research and Development, National Academy of Sciences (13) on a total of 62 paraplegic persons indicate that the orthoses were lighter than metal designs and required less energy for ambulation but severe mechanical limitations, such as donning and inflation problems, outweigh these advantages when the orthoses are used outside of an institutional setting.

A study by Cerney (12), at Rancho Los Amigos Hospital, comparing energy costs for eight paraplegics

*The Term "pelvic control" used here refers to the ability of the abdominals to move the pelvis when body weight is on the crutches.

¹Rehabilitation Engineering Center, Rancho Los Amigos Hospital, Downey, California.

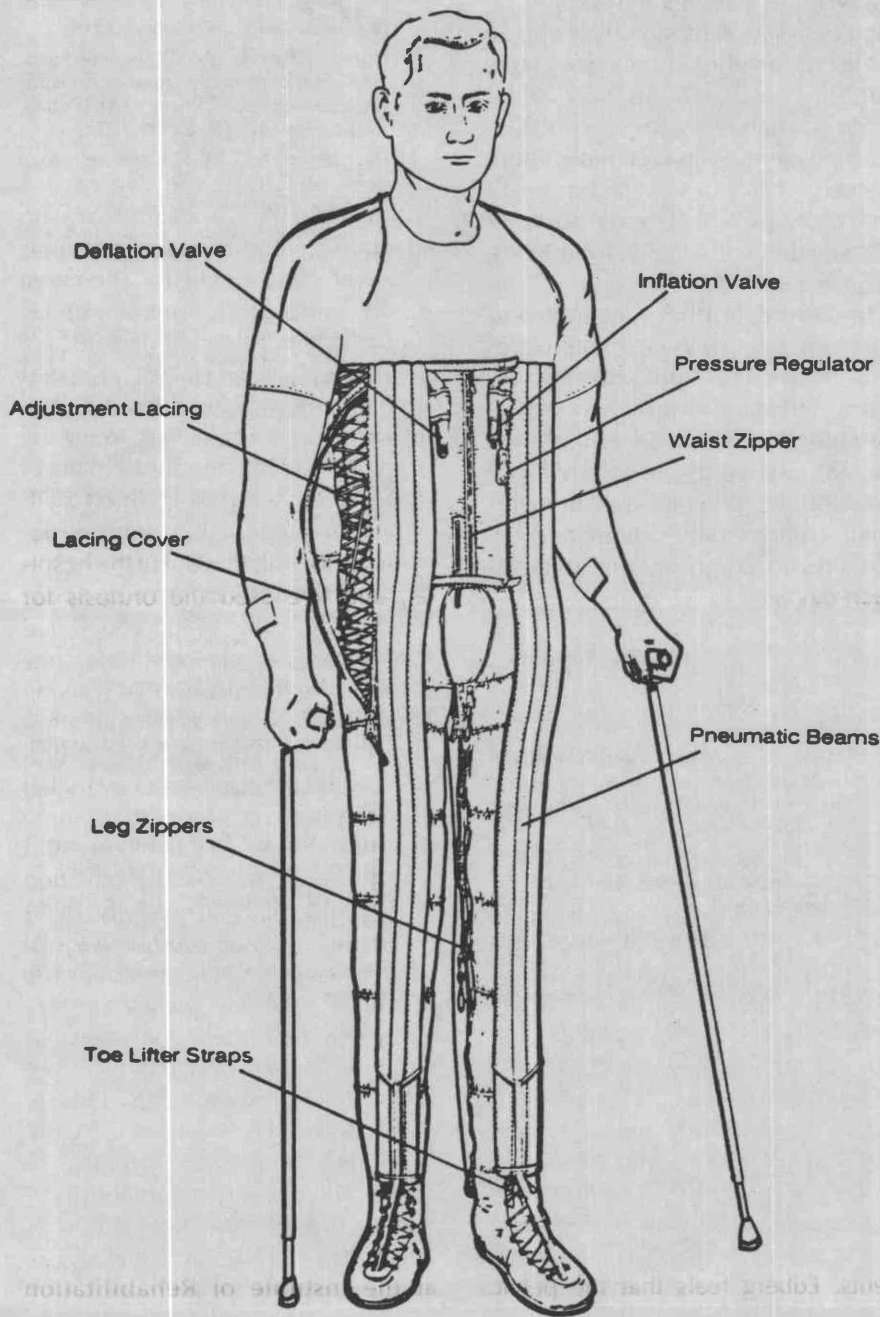


Fig. 1. Ortho-Walk Type B Pneumatic Orthosis.

walking versus using a wheelchair concluded "The average velocity for paraplegic walking was less than half of normal while oxygen uptake per minute was increased by 50 percent. These two factors combine to create an oxygen uptake per meter than is increased six times". Similar data for the same patients using wheelchairs, again compared to normal individuals, showed "only a two to six percent increase in the physiological factors and a ten percent decrease in velocity".

Despite the poor track record I have documented, ambulation is still considered a goal for paraplegic patients in most rehabilitation settings. Obviously, the patient will fail to reach this goal in most cases, so why do most of us expend our energies in this area? I feel there are benefits to be gained by providing ambulation training. For one, nearly all new paraplegic persons believe they will walk again, and it is virtually impossible to convince them otherwise. These patients feel that they are being

deprived of their chance for complete rehabilitation if they are never given the opportunity to try to walk. Psychologically, they must prove it to themselves. After these patients are convinced that walking is impractical, they will concentrate more heavily on becoming wheelchair-independent.

A physician I worked with in Chicago told the story of an obese, bilateral above-knee amputee who wanted to be fitted with prostheses so he could walk again. They physician refused to prescribe a prostheses as he knew that the patient could never use them, and told the patient he would not be able to walk again. The patient immediately suffered a nervous breakdown in the clinic and re-



Fig. 2. Craig-Scott Orthosis

quired hospitalization. From that day on, the physician prescribed prostheses for patients with similar problems so they could convince themselves of the impracticality of ambulation and, more important, have a longer period of time to accept reality.

A small percentage of patients do ambulate in orthoses (Fig. 3), espe-



Fig. 3. Polypropylene Knee-Ankle-Foot Orthoses for Paraplegia

cially those patients with pelvic or hip control or sensation. It is impossible to predict successful ambulators, and patients should be given a chance to succeed. Obviously, patients who lack motivation, are very obese, or who lack strength and endurance will never succeed and should be dissuaded from trying to ambulate.

In this article I have attempted to back up my personal experiences with information from published reports, and then to justify why most paraplegics are given ambulation training despite the poor prognosis. We would appreciate your thoughts on this subject and therefore encourage you to complete the attached questionnaire.

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