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Gait Analysis

INTRODUCTION

by Ronald F. Altman, C.P.O.†

The following series of articles all have to do with using gait analysis, in orthotics as well as prosthetics, to improve function. The Gage/Hicks study traces gait analysis in prosthetics from Inman forward, and the individual articles illustrate contemporary laboratory approaches to the objective assessment of gait.

Fundamental to optimal lower-extremity prosthetic/orthotic service is an analysis of the gait of the patient. To the extent the method of analysis fails to provide adequate objective or useful information about gait, it allows for the possibility and probability that a less than optimum fit and/or alignment configuration has been or will be achieved.

While gait analysis has long been an established procedure of varying objectivity in prosthetics, in orthotics the use of gait analysis has been rather ineffectual in assisting to optimize gait, a process which for the most part fails to go beyond a most rudimentary observation. This is due in part to the rudimentary functional characteristics of most orthoses.

Advances in our profession as well as technology and materials can and do result in more functional orthoses. If we are going to provide the optimal orthotic design configuration for any given patient, it is essential that we define gait characteristics more precisely and reliably.

Though not yet universally available, the increasing number of gait analysis facilities will soon benefit us all—patients and practitioners alike—as we gain access to the resulting information flow in formats readily usable by orthotists and prosthetists.

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Gait Analysis in Prosthetics

by James R. Gage, M.D.
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REVIEW

Objective measurement systems which quantify locomotion have been in use for the past century. But not until World War II, when thousands of men returned home to the United States with amputations, was technology really applied to the understanding of prosthetic gait.

Inman and colleagues[1] founded the Biomechanics Laboratory at the University of California to establish fundamental principles of human walking, particularly in relation to problems faced by lower limb amputees. Inman's measurement techniques included motion pictures of coronal and sagittal views, as well as transverse rotations from below using a glass walkway. Using interrupted light photography, the Biomechanics Laboratory team studied the motion of body segments during gait. Force plates measured the subject's ground reaction forces, and muscle activity was recorded using electromyography (EMG), which measures the electrical signals associated with contraction of a muscle. Prior to Inman's fundamental studies,