Dynamic Chiropractic

ORTHOTICS & ORTHOPEADICS

Sports Injury -- Understanding Gait

As gait forms an essential component of most sports, it is crucial that each and every student and doctor understand what gait is. To diagnose the abnormal, one must first be very comfortable with the normal; it is for that reason that MPI spends some time teaching the "norms" of gait.

Each gait cycle is divided into two periods, stance and swing. Stance has as components: initial stance, single limb stance, and terminal or double limb stance; swing has swing. Running is simply the elimination of double stance. The act of walking or running is rarely taught to include the remainder of the human frame, which is a shame, as the head, the trunk (with special emphasis given to the ribs), and the arms are intimately involved.

Let me give an example of exactly what I mean. At heel strike, all of the pretibial muscles are active. Can you name them? Which is most active? At what point during the gait cycle does the action of these three pretibial muscles cease? Which head of the gastrocnemius muscle fires first; at what point does the other head actually come into play? What muscles are involved in pulling the knee into hyperextension, if it is available? There are seven plantar flexors: can you name them and explain what they do during the gait cycle?

There are other questions. Describe the sling formed by the tibialis anterior and the peroneus longus. Explain the action of the fibula with respect to the windlass effect of Hicks and its resultant action on the long head of the biceps femoris during late midstance phase of gait through toe off. Does the long head of the biceps have an effect on the ipsilateral or the contralateral multifidus? What are the consequences of fibular dysfunction with respect to the multifidus during gait? How does rib cage or diaphragm dysfunction impact on normal gait? What is the effect of an increase in the thoracic cage and kyphosis on gait? The latissimus dorsi play a very important role in running gait but how does hamstring length effect the function of these large muscles? And is the intercostal muscle insignificant or critical to the aging population?

These are small points, but huge points when examining a patient that has come to you for diagnosis, treatment and rehabilitation. We teach how to integrate the actions of the foot, ankle, knee, hip, iliosacral and sacroiliac joints into a concept of total lower extremity function.

We also include all of the various types of abnormal gait patterns, as not all of our patients are athletes. Gait disturbances are caused by many neurologic, visual, vestibular, and musculoskeletal illnesses. These illnesses are common to all age groups and are particularly common in the older groups.

You may be asking yourselves, what has this to do with sports and sports injuries? What about the weekend golfer whose hip joint dysfunction causes him to alter his swing and to make compensatory changes that are now impacting his breathing, gait and upright posture? Golf is a sport and the person playing golf deserves to be seen by a knowledgeable sports chiropractor who understands the biomechanics of golf and the biomechanics of the adaptive/compensatory postures and gait patterning of the aging athlete. The proficient doctor of chiropractic, trained in these ways, will be able to advise the patient on ways of playing the game so that compensatory changes do not take place, and to construct a meaningful rehabilitation program. Golf is one of the fastest

growing sports in the world, and it only makes sense for it to be included in one of the future sports injuries modules.

Alteration of gait leads to impaired motion and this detriment affects approximately 15% of people over 65, a very large number when you consider that approximately 2/3 of the North American population will be over 65 just after the turn of the century. Alteration of gait has been cited as the leading form of neurologic and biomechanical impairment. The pathophysiology of exactly how this happens will be dealt with in some detail as a clear and concise understanding of how this is vital to all of our patients, athletes or not:

- the neural pathways of gait;
- the many etiologies of gait disturbances from the differential diagnostic point of view;
- the clinical manifestations of gait as an aid to neurologic and functional assessments.

Features of normal gait will be reviewed:

- stride length as it pertains to oxygen utilization will also be discussed as it impacts on all of our patients.
- discussion of the effect of total body center of mass with respect to the conservation of energy during normal and abnormal gait will complete this portion.

The long list of conditions that impact on a patient's ability to walk or run may differ significantly in their primary cause or pathology, however, the aberrations they create on the mechanics of gait clearly fall into four biomechanical categories:

- functional deformity (a decrease in passive mobility);
- muscle weakness and wasting;
- impaired control;
- pain as a result of DJD or dysafferentation.

Functional deformity has as a component the concept of contracture which in and of itself has two parts, those being elastic and rigid. Muscle weakness causes a modification in gait and muscle firing patterns and is of great clinical significance to the athlete of today. Impaired control can be thought of as an abnormality of afferent input, and as this component is so critical to chiropractic some time will be spent on this topic with a hands on portion to follow. Muscle weakness occurs secondary to the pain of a joint and causes reduced activity: a positive feedback loop.

We examine procedures, diagnosis, differential diagnosis and treatment/adjustments and rehabilitation plans dealing specifically with those component parts of the human frame that are directly impacted upon by gait dysfunction.

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