



## Saving Energy for Patients with Multiple Sclerosis

The focus of this writing is not to regurgitate the known pathology of multiple sclerosis, but rather to shed light on the orthopedic tools available for individuals of this devastating disease. Specifically with focus on understanding what has become not only important in research but more important to the patient; that being energy conservation.

Those with MS often lack the “energy” to get out the door and live life. That may be as simple as getting the mail or shopping for groceries. McAllister & Krup report that “fatigue is one of the most common symptoms of MS and it is considered to have a major impact on health related quality of life”. Franceschini *et al* showed that the energy cost of self-paced walking in mildly disabled individuals with MS was higher than that of control subjects.

The goal for the orthotist in this perspective is thus to assist with conserving that precious energy. Executing this service however is not always simple, yet as technological advances in orthotic design continue, so do the tools to offer.

The primary deficiency that effects energy consumption in individuals with MS is a spastic drop foot, inherent in the upper motor neuron disease category. This gait deviation demands additional energy costs due to gait compensations such as hip hiking, hyperextension of the knee, and circumduction of the limb. When one fails at the task of advancing their limb by any of the above mechanisms, the risk of falling becomes imminent and once again, energy taxing if not dangerous.

The basic treatment for this deficiency is to have a custom fabricated AFO fitted and tuned to the patient that eliminates any drop foot deformity and secondary compensations. A recent study by Bergman *et al* shows that patients with MS that use an AFO to treat drop foot show “a significant improvement in walking speed and energy cost (12%)” The caveat however, is that in many cases, for the individual a brace (AFO) may be an energy taxing device in of itself. Sometimes, correcting a

deformity may also block other *wanted* motions of the ankle. The goal of preventing the drop foot would be met and the patient is thus safe; however, another aspect of normal gait is eliminated. Commonly, the push off phase of gait is sacrificed since late stance plantar flexion is prevented with such a device.

It is thus incumbent upon the experienced orthotist to seriously consider the options in design. Brace weight, functional biomechanics, footwear, gait deviations are all factors playing into the treatment. One advancement that is noteworthy is the use of carbon fiber composites as the parent material for AFOs. These devices are unmatched in strength to weight ratio and offer an energy return effect. Simply put, they are extremely light and often desirable to the patient. If the device is deemed appropriate by the orthotist, it may prove to be an invaluable tool.

Bracing may go beyond a simple AFO. Other tools may be as simple as custom fabricated foot orthoses to maintain a balanced foot structure. This may offer a greater sense of stability for the individual, or may improve comfort by reducing ankle/foot pain. More elaborate solutions could include the use of a KAFO (knee-ankle-foot-orthosis) if there is severe instability of the knee as well as the ankle/foot. Once again; serious considerations of cost versus benefit will be needed. These braces are superior in stability and correction but are heavy and awkward to use.

### **Carbon fiber AFOs are very light and improve gait efficiency**

Energy consumption is a valuable metric when considering an orthotic solution. There are numerous orthotic designs and materials available to the Certified Orthotist, meaning that there are numerous solutions for the patient suffering with multiple sclerosis.

