

To Brace or Not to Brace? Improving Function

*By Holly H. Wise, PT, PhD, and Jenny Adams, CPO,
Coastal Post-Polio Clinic, Charleston, South Carolina*

Many polio survivors wear braces (orthoses) or have had braces recommended to them. Frequently, the question is raised, “Does the use of a brace accelerate the weakening of the braced muscles?”

To Brace?

Braces are typically recommended to polio survivors to provide stability to a joint(s) and can improve function, decrease pain and enhance energy conservation. In addition, bracing may allow individuals to increase their levels of physical activity by improving overall muscular strength and cardiovascular endurance, which are both important for health and wellness.

Some persons with a spinal cord injury or reversible peripheral neuropathy, who have increased activity as the result of bracing to immobilize one or more joints, have noted an improvement in strength. This observation demonstrates that bracing does not prevent a muscle from being able to contract. Increasing strength may not be possible with muscles that have lost **functional** strength due to prior polio. The case study below illustrates the benefits of bracing for a polio survivor.

Polio Survivor Case Study

SJ is a 53-year old male who works fulltime in a large corporation. SJ acquired polio at age 2 with involvement in his right lower leg. He participated in sports in high school despite a mild limp. He exercised on a regular basis until several years ago when he developed right hip pain when walking long distances and putting on his shoes. He was evaluated at the Coastal Post-Polio Clinic and reported the following:

- Right ankle and hip pain,
- Difficulty with balance when climbing a ladder at work,
- Fatigue after a full day of work, and
- Difficulty sleeping with muscle twitching in the right calf at night.

SJ's right calf muscle was significantly smaller than the left. His right lower leg was shorter and his foot was one size smaller. In addition, SJ had limited flexibility in his right ankle when walking. A muscle test revealed that he had significant weakness in the right ankle dorsiflexors and plantarflexors.

The dorsiflexors are ankle muscles that lift up the foot as one swings the leg forward when walking. Individuals who report tripping or stumbling when walking have dorsiflexors that are weak.

The plantarflexors are the calf muscles that help push off on the toes when walking forward. When these muscles are weak, individuals report difficulty walking on their toes. Both groups of muscles are important for maintaining balance and when either group of muscles are weakened, safety can be a concern.

The assessment of SJ's walking, or gait pattern, revealed that he walks with a “steppage gait” – he picks his knee up higher than normal. Individuals expend additional energy when picking their legs up higher than normal, but they avoid tripping over their feet. This difficulty in lifting the toes and ankle up is due to muscle weakness.

Due to the tightness in his right heel cord, SJ had excessive backward bending of his knee whenever he put full weight on his leg. Excessive backward bending, also known as hyperextension, leads to abnormal biomechanical stresses at the hip and trunk.

A modified Fatigue Severity Scale (FSS) was administered, and SJ received a score of 33/36, indicating a high level of fatigue with his activities.

The team recommended a plastic ankle-foot orthosis (AFO). SJ was evaluated by the team orthotist and was fitted with a custom AFO. He was instructed to gradually increase his wearing time as he adjusted to the AFO.

SJ was seen *3 months later* and reported the following:

Decreased ankle pain, but hip pain was unchanged due to arthritis and SJ was placed on Celebrex.

Decreased knee hypertension when walking.

Decreased muscle cramping at night due to a decrease in overuse of his calf muscles affected by polio, and

Decreased fatigue – his new FSS score was 23/36.

SJ was seen *one year later* after being fitted with the AFO.

He has not lost any strength in the muscles supported by the brace.

His wife can no longer recognize him at a distance because he no longer walks with a noticeable limp and does not land as hard on his left leg when walking.

Not to Brace?

Many polio survivors are fearful that they will lose functional strength when wearing a brace and choose not to even explore the benefits. *It is important to understand that bracing is not recommended if the survivor has functional strength.* Rather, a brace is recommended when the muscle has deteriorated to less than a functional level resulting in joint instability and overuse of uninvolved muscles and joints.

All muscles show a slow decline in strength with aging. With a normal decline in strength due to natural aging, the decline in function is more dramatic for a muscle affected by polio. This is due to the fact that a muscle affected by polio does not have the same number of nerves and muscle fibers as an unaffected muscle. A muscle affected by polio may appear to have full strength, but has overcompensated for years.

In theory, immobilization of a joint with bracing may result in a decline in strength in the specific muscles around that joint. But, *a decline in strength also occurs with the aging process.* Using a brace with a mechanical joint that allows some limited movement may prevent the weakness associated with immobilization. A careful discussion of the components of a brace with a Certified Orthotist (CO) is necessary to develop the most functional design.

“The Question”

To brace or not to brace? There is no one correct answer. It can be found within each individual and with recommendations from trusted health professionals knowledgeable about polio and post-polio syndrome. Each polio survivor must examine his/her goals for mobility and participation in activities of daily living and his/her health and wellness. The goals must reflect individual concerns and be cost-effective. Discussion about the pros and cons of bracing is a hallmark of a good team approach when managing post-polio syndrome.

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