Neuromuscular Conditions in Geriatric Pedorthics

Patricia Pande, PT, CPed

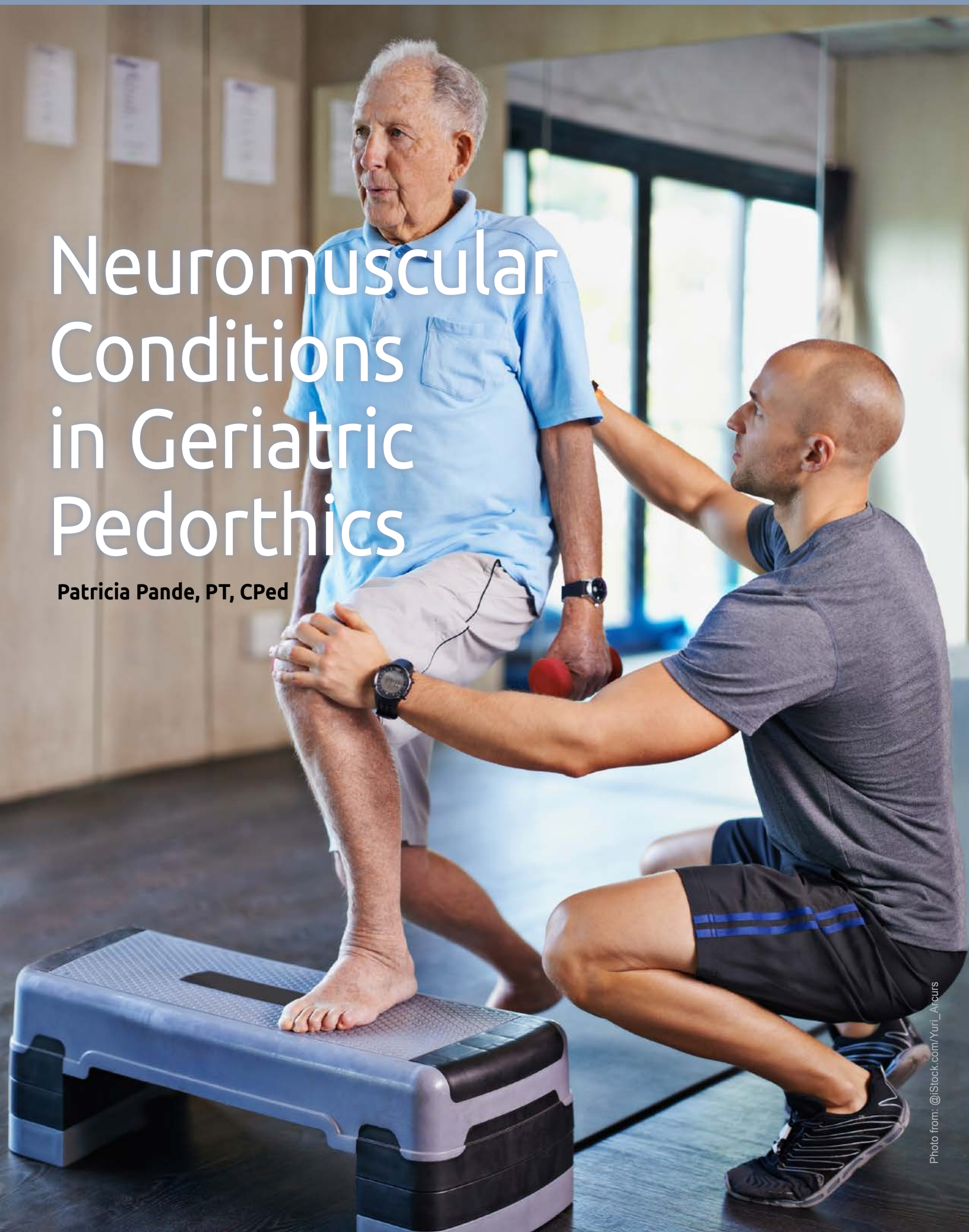

Photo from: @iStock.com/Yuri_Arcurs

CEP

The scope of this article discusses pathology and pedorthic treatment options for two neuromuscular conditions the are often found in the geriatric population, Parkinson's Disease and Post-Polio Syndrome. This article is available for *Continuing Education Unit* (CEU) credit.

Parkinson's Disease

Parkinson's disease (PD) is a serious progressive neurodegenerative disorder caused by a loss of dopamine neurons in the basal ganglia of the brain. As neurons are lost, patients show increasing tremor, rigidity, and mental symptoms. Some patients tend to have increasing deposition of protein clumps in brain cells, called Lewy bodies, which may cause the death of neural tissue (Davie 2008, Nilson et al. 2010). As a result, patients with PD often develop symptoms of dementia, commonly labeled sub-cortical or Lewy-body dementia.

Although the early stages of PD are typically characterized by barely noticeable tremor and stiffness of posture and gait, these symptoms progress with increasing disease. Patients invariably develop significant gait abnormality and difficulty with postural stability leading to functional restriction and a risk of falls or other injuries. In this group, falls may result in fractures due to the loss of bone density (Raglione 2011).

Pedorthists are well suited to address a variety of PD issues including motion-related gait abnormalities, freezing gait (Hausdorff 2009 and Nilsson et al. 2010), shuffling gait (ibid), decreased stride length (Hausdorff 2009), and increased fall risk (Voss et al. 2012).

Assessment of the Feet in Parkinson's Disease

The neurological assessment of PD is beyond the scope of pedorthic practice, but pedorthists can identify difficulty in initiating movement and evaluate the quality of the patient's

Read This Article, Take Survey to Earn Continuing Education Points

The Pedorthic Footcare Association (PFA) offers Continuing Education Points (CEPs), approved by the American Board for Certification in Orthotics, Prosthetics & Pedorthics, Inc. (ABC) and the Board of Certification/Accreditation (BOC), via specially designated articles within *Current Pedorthics* magazine.

To take advantage of the program, thoroughly read the adjacent CEU article and then visit: **www.pedorthics.org** and click on the *Continuing Education Opportunities* tab to purchase the 10-question quiz associated with this article. CEP quizzes cost $15 for members and $25 for non-members. The quizzes are worth 1.0 Scientific or Business CEP, depending on the content. Successful completion of the quiz will result in 1.0 CEP reported directly to ABC and BOC at the end of each quarter.

Look for additional CEP-eligible articles in future issues of the magazine; previous articles are available in the magazine archive at **www.pedorthics.org**.

If you have any questions, contact PFA, at (229) 389-3440 or e-mail: **ceu@pedorthics.org**.

gait. The pedorthist should note the patient's balance along with their base of support and gait.

PD may adversely affect foot structure, and many patients show a lack of transverse arch and overuse of the toe flexors from forceful gripping to maintain foot support (Michaud 1997). Patients may develop hammer toes, perhaps resulting from weakness of the ankle dorsiflexors and overuse of the toe extensors (Sahrmann 2002 and Hanseen 2000). Tibialis anterior weakness and tightness of the posterior calf are also common to PD.

Orthoses

Researchers have not studied the impact of orthoses on patients with PD, but extrapolations have been made based on the study of footwear in high fall-risk seniors (Chaiwanichsiri et al. 2001). Lightweight, accommodative EVA orthoses with a deep heel cup and high medial and lateral walls are recommended for use (Zelinke 2012). Some studies indicate that firmer materials may improve balance and can be adapted with further cushioning and offloading in appropriate areas near the metatarsal heads (author's concern re tactile instability from too accommodative a device).

- Figure 1 -

Footwear in Parkinson's Disease

Because footwear is of paramount importance in reducing fall risk, patients should consider heel height, type of closure, slip resistance, and collars in shoes. Professionals recommend footwear that is supportive around the ankle with a higher collar, firmer sole (Menant et al. 2008), reduced heel height, and mild tread (Li, Wu and Lin 2004) (*Figure 1*). Rocker shoes are not suggested without specific physician recommendations due to their inherent stability and fall risk (Gross 2010). Some of the modifications to footwear that further reduce the risk of falling are:

1. Medial or lateral flares or buttress to increase contact surface area.

2. Enclosed shoes rather than slip-on (fall risk research).

3. Lighter shoes over heavier ones (leather, deerskin, or mesh).

4. Shock attenuation with outsoles that have vibram but are not so soft that they reduce balance (Menant et al. 2008).

5. Heel height; although there is a need to compensate for equinus; heels that are too high may displace the center of gravity anteriorly and create a fall risk (Gross 2004).

6. Less aggressive treads help with slip resistance in industrial settings but may increase coefficient of friction too much in this population.

7. Wide base of support with the shoe fit for width.

8. A straighter last shoe will provide more contact area (the author's personal opinion).

Shoe Photos: Courtsey of Patrica Pande

9. Torsional rigidity; if the shoe collapses or buckles, the patient may have more instability.

10. Extra-depth shoes may accommodate hammer toes and reduce pressure on the dorsum of the toes.

Shoe modifications

1. Offloading the tips of the toes with provision of PPT in the toe box or excavations in the sole.

2. Shoe stretching: spot stretching with a ball and ring ensures that the upper still fits well and gives tactile support.

3. Rocker soles may enhance movement across tight metatarsal phalangeal joints and reduce plantar pressure, but appropriate training in their use is advocated due to fall risk (author's comments – it may be more appropriate to do metatarsal-only rockers).

4. Shoes with good fixation (but Velcro closures may be necessary for PD patients who may have hand tremors).

5. Shoes with an uptoe may help with toe clearance where the tibialis anterior is weak.

6. Toe sliders, while helpful, must be used judiciously due to the risk of falling if the slider is too proximal (Zelinka 2012).

Gait Training in Parkinson's Disease

Many new evidence-based studies suggest that

Nordic walking greatly improves parameters of gait. Pedorthic facilities that sell Nordic walking sticks should collaborate with physical therapists on appropriate technique (VanEijkeren 2008).

Post-Polio Syndrome

Post-Polio Syndrome uniquely affects people with a previous diagnosis of polio. Patients present with pain, weakness, and fatigue, many years after their initial episode of polio. The delayed onset of muscle weakness may be as long as 20 to 40 years after the initial illness (Flansbjer and Lexell 2010). The effects of aging on muscle fibers may exacerbate post-polio symptoms of pain and weakness and increase joint stresses around unstable joints.

Assessment of foot and ankle in Post-Polio Syndrome

Physical medicine specialists or physical therapists are best equipped to evaluate post-polio patients. Muscle weakness can lead to difficulty with ambulation (Flansbjer and Lexell 2010), stair climbing, and negotiating curbs and ramps.

Patients often present with compensatory strategies such as hip hiking and genu recurvatum (Gent et al. 2010).

Treatment: bracing and orthoses in Post-Polio

Braces are primarily used to prevent instability and destruction of joints, though KAFOs are recommended. If more proximal joints are involved, the professional should exercise caution so as not to compromise any compensatory maneuvers that allow the patient to ambulate (Morew et al. 2008).

Studies on lightweight carbon fiber support the benefits of AFOs and KAFOs for this patient population (Trojan and Cashman 2005). Practitioners must address drop foot with a lightweight material to prevent fatigue, overexertion, and further muscle pain (Trojan and Cashman 2005).

Footwear

Shoes must be lightweight but supportive, and the treads must not be too wide or large to avoid falls due to fatigue and weakness. The ankle may be stabilized by three-quarter length or high-top footwear that must accommodate AFOs. Offloading the AFO due to neuropathic changes is a mainstay of treatment. Flares, wedges, and other modifications address a variety of weaknesses but materials must always be selected for their weight and bulk. The shoe must be adaptable for flares and wedges. (*Figure* 2)

In summary, the pedorthist can have impact on the geriatric patient with neurodegenerative or neuromuscular conditions. With their knowledge of foot anatomy and shoe construction and design (including modifications), they form an integral part of the multidisciplinary health care team. Enhancement of gait, function, and stability occur with communication of findings and education re footwear and products to reduce risk of falling. Follow-up and gait evaluation are critical elements to keep the geriatric patient with neuromuscular conditions ambulatory and active.

- Figure 2 -

PFA