

Podiatry's role in managing children and adults with Cerebral Palsy



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Introduction

Cerebral palsy (CP) is a non-progressive disorder of posture or movement due to a lesion of the developing brain.¹ This neurological disorder affects motor skills and coordination. It is caused by damage or malformation to the developing brain in uterine (pre-birth), childbirth, or early childhood (typically up to 5 years). How CP affects a person will depend on the location of the brain injury. Typically, a person with CP presents with stiffness (spasticity or muscle tone), uncoordinated movement patterns and uncontrolled movements. Presentation ranges from someone who can function very normally to someone who requires assistance with all aspects of daily living. While CP is most commonly diagnosed in children, most individuals may continue to experience tissue damage and related complications in adulthood.

People with CP often experience complications with their feet and lower limbs, such as gait anomalies due to muscle spasticity, poor balance, and foot deformities. Podiatrists can help manage these issues through assessment, treatment, and advice on a wide range of issues to prevent further complications.

Children

Podiatrists play an important role in helping children with CP manage foot and lower limb problems that can impact their mobility, balance, access to healthy lifestyle opportunities, education, and overall quality of life. Some specific examples are:

- Assessing foot and lower limb function: podiatrists perform comprehensive assessments to evaluate a child's foot and lower limb function, including muscle tone, range of motion, gait patterns, and foot structure
- Developing treatment plans: based on the assessment results, podiatrists develop individualised treatment plans that may include exercises, orthoses, or other interventions to improve foot and lower limb function and reduce pain
- Providing pre-fabricated or custom-made orthoses (insoles): podiatrists may recommend orthoses to improve or maintain foot function, reduce pressure on specific areas, and improve walking patterns.² Orthoses may slow the progression of foot deformities and improve overall mobility
- Recommending appropriate footwear: podiatrists can advise parents and caregivers on appropriate footwear for children with CP, considering the child's foot structure, level of mobility, and any assistive devices they may use. Appropriate footwear can help prevent falls and improve overall comfort
- Supporting educational needs: for some children, a diagnosis of CP can impact a child's ability to learn if the correct adjustments are not put in place. Podiatrists can contribute to a school's understanding of the child's requirements, whether informally or through adding to the 'Education, Health and Care' plan if significant adjustments are required

- Support and signposting for advice to other services: This can vary by child but can encompass areas such as weight management as children with cerebral palsy are at risk of being underweight and overweight³. It could also cover accessing mental health⁴ and learning disability services
- Preventive treatment: nail and skin care to prevent infections and other complications
- Podiatrists may make onward referrals to paediatricians for further assessments if a child presents with symptoms typical of CP, but who has not had a diagnosis

Toe walking is a common gait abnormality in children with CP, occurring in up to 60% of cases.⁵ It is defined as walking on the balls of the feet or the toes, rather than with the entire foot flat on the ground. This can occur on one or both sides when walking or standing. This can be a sign of muscle spasticity or tightness in the calf muscles, or hamstrings which can make it difficult for the child to walk with a heel-to-toe gait pattern. In some cases, it may also be related to foot and ankle deformities. Children with CP can also have decreased muscle strength, or an imbalance compared to typically developing children, which can contribute to ankle instability.⁶ This can lead to problems with balance, mobility, and an increased risk of pain, falls and injuries. Prolonged toe walking can lead to muscle shortening and joint contractures that can make it even more difficult for the child to walk properly.⁷ Children may be at risk of developing complications such as hip dislocations and pressure wounds, particularly those who fall into the least mobile groups.

Podiatrists can perform a comprehensive gait analysis to evaluate the child's walking pattern and determine the underlying cause of the toe walking. Treatment options may include:

- Exercises: podiatrists can recommend specific exercises to strengthen or stretch the muscles in the legs and feet, which can help improve foot and ankle range of motion and minimise the impact of muscle spasticity²
- Orthoses: pre-fabricated or custom orthoses may be used to support foot function and reduce pressure on the middle of the foot due to any muscle spasticity²

- Ankle-Foot Orthoses (AFO): AFOs can be used to help improve foot and ankle function and provide support during walking. This can help reduce the need for toe walking and improve overall gait patterns
- Heel raises or shoe modification: There may be a limb length discrepancy identified in some children with CP, so these may be appropriate⁸
- Medical management: in some cases, podiatrists may liaise with Paediatric Consultants regarding the use of/dose adjustment of Baclofen or Botulinum Toxin type A (Botox) injections to help manage muscle spasticity; this can help to manage pain and can improve foot and ankle range of motion when used in conjunction with options such as serial casting⁹
- Pain relief: podiatrists may liaise with the wider multi disciplinary team to help manage leg pain in people with CP
- Surgery: in severe cases, surgical interventions may be necessary to correct foot and ankle deformities or lengthen tight muscles and tendons¹⁰

Pacing and physical activity advice: Fatigue is often a big presenting factor for a child with CP. Advice on how to manage normal childhood activities with this can form an important element of a podiatrist's role. Podiatrists can also provide advice and guidance to children, families, and their wider network, such as schools for activities that would be beneficial to the child. Physical activity is important, and podiatrists can support with any modifications for them to participate fully.¹¹

Serial casting

Serial casting is a therapy in which a number of casts are used to improve dorsiflexion at the ankle joint in children with cerebral palsy.¹² The casts are changed weekly or fortnightly and the length of casting is generally 3-6 weeks.

The aim of serial casting is to increase the range of passive dorsiflexion at the ankle joint and reduce toe walking, thereby reducing soft tissue contractures around the ankle joint and improving gait.

Early intervention at the time of development produces better outcomes for people with CP moving into adulthood. Podiatrists should have a good awareness of the risks associated with Cerebral Palsy and ways to minimise them, as part of the multidisciplinary team.

Children with CP will likely have a high number of medical appointments to attend, therefore attempts to join up these appointments are beneficial to reducing the impact on school attendance and time parents/guardians have to take time off work to attend.

Adults

Adults with CP may experience complications in various parts of the body, including the musculoskeletal system, cardiovascular system, and respiratory system.

Musculoskeletal system: individuals with CP may experience muscle weakness, spasticity, and contractures, which can lead to tissue damage and pain. They may also develop joint deformities, such as hip dislocation, scoliosis, and foot deformities, which can result in tissue damage to the heart and blood vessels.^{13,14} The majority of these complications will have started to show in childhood.

Cardiovascular system: individuals with CP may have an increased risk of cardiovascular disease due to decreased physical activity and a sedentary lifestyle. They may also experience abnormal heart rhythms, such as atrial fibrillation, and hypertension, which can result in tissue damage to the heart and blood vessels.^{15,16}

Respiratory system: individuals with CP may have impaired lung function due to weak respiratory muscles and scoliosis. This can lead to tissue damage in the lungs and an increased risk of respiratory infections.^{17,18}

Common podiatric interventions for people with CP include:

- Pre-fabricated or custom-made orthoses to improve foot function and reduce pressure on specific areas
- Strengthening exercises to maintain muscle function and mobility
- Footwear modifications to accommodate braces, AFOs, or other assistive devices

- Pressure redistribution to improve tissue viability
- Nail and skin care to prevent infections and other complications
- Gait analysis and training to improve walking patterns, avoid and reduce pain and reduce the risk of falls.

Ankle instability

Ankle instability is a common problem in people with CP. This may be due to low muscle tone causing weakness and increased flexibility, or high muscle tone causing stiffness and spasticity, and contracture. Ankle instability has a major impact on a person's gait, ability to walk unassisted and an increased risk of falls. People with CP are at an increased risk of ankle sprains, which can lead to chronic ankle instability.

Those with spastic diplegia CP, or any lower limb spasticity, have reduced ankle dorsiflexion during gait, which can lead to compensatory movements and ankle instability.¹⁹ Improving ankle stability can lead to improved gait,²⁰ and intervening early on may help to prevent osteoarthritis.²¹

Footwear and modifications

Appropriate footwear is imperative to enable support and stability. Whether this is through bespoke footwear and orthoses, or footwear advice.

Podiatrists can support parents/ guardians of children with CP and adults in the fitting and choice of footwear that meets the individual requirements. This may be bespoke therapeutic footwear or can also include everyday footwear from general retail. The match between assistive devices, footwear and presenting complaint is critical to the success of a patient's outcomes.²²

The lowest cost intervention is optimal for both public and independent health service providers, and parents/guardians of children with CP, and adults with CP. Therefore, those with mild CP may only require pre-fabricated orthoses.

Tissue integrity

Both adults and children with CP may also experience tissue damage due to their condition. Individuals with CP may have increased levels of oxidative stress and inflammation, which can lead to damage to cells and tissues.²³ Children with CP have higher levels of oxidative stress markers in their blood

compared to developing children who do not have the condition.

Podiatrists' experience in reducing the risk of pressure ulceration is crucial in helping people with CP remain ulcer-free.

Learning Disabilities

A learning disability is not a direct outcome of cerebral palsy. Cerebral palsy is a motor disorder, meaning that it primarily affects one's ability to control their movements, balance, and posture. However, approximately 50% of people with CP have some degree of a learning impairment. Learning difficulties are not linked to specific regions of brain damage, but rather due to poor connectivity between neural pathways in the brain.²⁴

Children with CP and a learning disability will still have cognitive functions and will be capable of learning, sensing, and reasoning. Depending on the strength of connectivity within the brain, more time and effort may be required to process and learn new skills.

Multidisciplinary working

Podiatrists work closely with other healthcare professionals, such as paediatricians, physiotherapists, occupational therapists, and orthopaedic surgeons, to provide comprehensive care for children and adults with CP. By addressing foot and lower limb issues, podiatry can help improve mobility, reduce pain, and enhance the overall quality of life for people with CP. By working as part of a team, podiatrists can help ensure that children and adults receive the best possible care to support their foot and lower limb function, and overall quality of life.

Biopsychosocial model

By using a multidisciplinary approach to long and short term treatment planning, healthcare professionals are able to ensure their treatments and interventions will not only enhance quality of life for the child with CP long term but will enable the team to work symbiotically to ensure effectiveness. The symptoms, prevalence, aetiology, and management of the condition are viewed through biological, social, and psychological lenses to form a better understanding of the disorder. Through expertise looking at different aspects of intervention, and subsequent cause and effect, a greater analysis can be used to design treatment plans with the child and their caregiver.

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