Canadian MSK Rehab Research Network

Impact of foot orthoses' design on gait in children with Charcot-Marie-Tooth

We wanted to know

Does a new way of designing foot orthoses (called **FOmax**) help children with Charcot-Marie-Tooth walk better than orthoses made with traditional methods (**FOclass**) ?

What is the problem?

Charcot-Marie-Tooth is a rare condition that affects the nerves controlling movement and sensation in the arms and legs. Many children with CMT develop cavovarus feet, which become stiff over time, causing pain as well as balance and walking difficulties. Doctors often prescribe foot orthoses (FOs) to help, but there are no guidelines on how to design them. The foot shape is complex and difficult to assess, increasing the chance that the FOs do not work properly. For this, we created a decision-making tool to guide clinicians in designing better FOs. The tool ensures the FOs fit closely to the foot, spreading pressure more evenly across the sole. This can reduce pain and improve comfort, walking, and balance.

How did you study the problem?

In a pilot study, 11 children with CMT used FOclass and then FOmax for three months each. After each period, we measured their walking with advanced tools: a 3-D motion capture, which tracks body movement in detail, and a plantar pressure analysis, which shows weight distribution across the sole of the foot. We tested if FOmax helped walking and lowered pressure on vulnerable parts of the foot.

What did you find?

Children walked better with FOmax than with FOclass. It helped them walk faster, take longer steps, and spend more time standing on one leg during walking. We saw less pressure on the outer middle part of the foot, meaning weight was shared more evenly, which may make walking more comfortable. A follow-up study tested showed that the foot measurements used were consistent and reliable.

How can this research be used?

Our results show that this new method is reliable, easy to use in clinics, and helps design foot orthoses that fit better and spread pressure more evenly. For people with CMT, this may reduce pain, prevent further problems in the legs or spine, and improve walking and balance. The approach could also benefit other conditions, making it useful across patient groups. It provides a foundation for evidence-based guidelines and a benchmark for future studies, supporting more consistent care and better outcomes.

Cautions

These results must be considered with caution due to the small sample of this study. A larger study is underway to confirm these findings and provide stronger evidence about how FOmax affects walking and foot pressure. The reliability of the foot measures, also a part of this larger study, are not yet published.

Reference: Martel M, Parent A, Émond M, Rivet N, Fortin C, Ballaz L. Foot orthosis design for children with Charcot-Marie-Tooth and impact on gait. Prosthet Orthot Int. 2025 Oct 1;49(5):485-493. doi: 10.1097/PXR.0000000000000426.

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