



A Novel Prosthesis Design to Improve Partial Foot Amputees Gait Using a Carbon Composite AFO

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Currently accepted understanding is that high-profile foot prostheses can have major improvements on biomechanics of walking for partial foot amputees despite their solid structure. These devices are able to restore the effective foot length due to this solidity. But the silicone prostheses are more deformable and light weighted increasing the usability while decreasing effective foot length to the distal end of the stump. In this paper, a novel design for high-profile prostheses has been presented to improve the gait of partial foot amputees using a custom shaped carbon AFO (Ankle Foot Orthosis) and increase the stability of walking during the stance phase while providing a more flexible ankle-foot joint. Four subjects (three chopart and one lisfranc amputees) were included in this study and four individual prostheses fabricated for these subjects. A 3D gait analysis used to evaluate the functionality of these new devices in restoring the effective foot length and improving vertical GRF (Ground Reaction Forces) applied to the amputated leg compared to their old devices using forceplate data. The results showed a significant improvement in walking speed. As for the COP (center of pressure) excursion a relatively normal progression along the length of the remnant foot during stance phase observed in comparison with silicone and clamshell prostheses. The vertical GRF data also showed that the pattern of carbon AFO aided device is more likely to normal population.