

EchelonVT

EchelonVT combines the technology of Echelon hydraulic ankle with the design principles of the TT Pro adaptor, building on the success and benefits gained from both to improve the user experience. The damped behaviour of Echelon enhanced user comfort and health by reducing the loading rates and forces acting on the prosthetic socket and residual limb skin. With the addition of axial and torsional compliance, provided by the VT element, interface pressures and shear forces at the socket-residuum interface are reduced yet further, protecting the skin of the residual limb and allowing the user to achieve an enhanced performance without fear of injury.

Improvements in Clinical Outcomes using Echelon compared to ESR feet

Improvement in **SAFETY**

- Reduced risk of tripping and falls
 - Increased minimum toe clearance during swing phase^{1,2}
- Improving standing balance on a slope
 - 24-25% reduction in mean inter-limb centre-of-pressure root mean square (COP RMS)³

Improvement in **ENERGY CONSUMPTION**

- Reduced energy expenditure during walking
 - Mean 11.8% reduction in energy use on level ground, across all walking speeds⁴
 - Mean 20.2% reduction in energy use on slopes, across all gradients⁴
 - Mean 8.3% faster walking speed for the same amount of effort⁴

Improvement in **MOBILITY**

- Improved gait performance
 - Faster self-selected walking speed^{2,5-7}
 - Higher PLUS-M scores than FlexFoot and FlexWalk style feet⁸
- Improved ground compliance when walking on slopes
 - Increased plantarflexion peak during level walking, fast level walking and cambered walking⁹
 - Increased dorsiflexion peak during level walking, fast level walking and cambered walking⁹
- Less of a prosthetic “dead spot” during gait
 - Reduced aggregate negative COP displacement⁵
 - Centre-of-pressure passes anterior to the shank statistically significantly earlier in stance⁵
 - Increased minimum instantaneous COM velocity during prosthetic-limb single support phase⁵
 - Reduced peak negative COP velocity⁷
 - Reduced COP posterior travel distance⁷
- Improved ground compliance when walking on slopes
 - Increased plantarflexion range during slope descent¹⁰
 - Increased dorsiflexion range during slope ascent¹⁰

Improvement in RESIDUAL LIMB HEALTH

- Helps protect vulnerable residual limb tissue, reducing likelihood of damage
 - Reduced peak stresses on residual limb¹¹
 - Reduced stress RMS on residual limb¹¹
 - Reduced loading rates on residual limb¹¹

Improvement in LOADING SYMMETRY

- Greater contribution of prosthetic limb to support during walking
 - Increased residual knee negative work⁶
- Reduced reliance on sound limb for support during walking
 - Reduced intact limb peak hip flexion moment⁶
 - Reduced intact limb peak dorsiflexion moment⁶
 - Reduced intact ankle negative work and total work⁶
 - Reduced intact limb total joint work⁶
- Better symmetry of loading between prosthetic and sound limbs during standing on a slope
 - Degree of asymmetry closer to zero for 5/5 amputees³
- Reduced residual and sound joint moments during standing on a slope
 - Significant reductions in both prosthetic and sound support moments¹²
- Less pressure on the sole of the contralateral foot
 - Peak plantar-pressure¹³
- Improved gait symmetry
 - Reduced stance phase timing asymmetry¹⁴

Improvement in USER SATISFACTION

- Patient reported outcome measures indicate improvements
 - Mean improvement across all Prostheses Evaluation Questionnaire domains¹⁵
 - Bilateral patients showed highest mean improvement in satisfaction¹⁵
- Subjective user preference for hydraulic ankle
 - 13/13 participants preferred hydraulic ankle¹³

Improvements in Clinical Outcomes using shock-absorbing pylon/torque absorber compared to rigid pylon**Improvement in SAFETY**

- Reduced back pain during twisting movements e.g. golf swings¹⁶

Improvement in MOBILITY

- Reduced compensatory knee flexion at loading response¹⁷
- No reduction in step activity¹⁸
- Blatchford torsion adaptors match the able-bodied rotational range¹⁹

Improvement in RESIDUAL LIMB HEALTH

- Reduced loading rate on prosthetic limb²⁰, particularly at fast walking speeds²¹
- Users feel less pressure on their residual limb²²

Improvement in **USER SATISFACTION**

- Patient preference, citing improved comfort, smoothness of gait and easier stairs descent²⁰

References

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