



Effectiveness of the RoFT® Microprocessor-Controlled Prosthetic Ankle in Transtibial Amputation

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Background

- ❖ Microprocessor-controlled prosthetic ankles (MPA) improve gait biomechanics
- ❖ Comparative evidence between devices remains limited
- ❖ RoFT® (MPA-2) is a newly developed prosthetic ankle

Objective

❖ **To evaluate the effectiveness of MPA-2** and compare it with;

- Conventional prosthetic ankle (CPA)
- Commercial MPA (Meridium®, MPA-1)



MPA – 1
(Meridium®)



MPA – 2
(RoFT®)

Methods

❖ Study design

- Multicenter randomized crossover trial
- January 2020 – December 2023
- 3 tertiary hospital in South Korea (VHS, Asan, Chungnam)

❖ Participants

- n = 18
- unilateral transtibial amputation

❖ Protocol

- CPA → MPA-1 → MPA-2
or CPA → MPA-2 → MPA-1
- Each MPA : 2-week adaptation period
- Washout with usual CPA

❖ Outcomes

- 3D gait analysis (spatiotemporal, kinematics, kinetics, ground reaction forces)
- Symmetry index
- CPET (energy expenditure)

❖ Statistics

- Repeated-measures analysis (GLS or Friedman)
- Bonferroni-adjusted post hoc test

Results

❖ Spatiotemporal

- Significant differences in stance, swing and double support time

❖ Kinematics (Fig.1)

- ↑ Plantarflexion during loading response
- ↑ Dorsiflexion in late stance
- ↑ Ankle range of motion

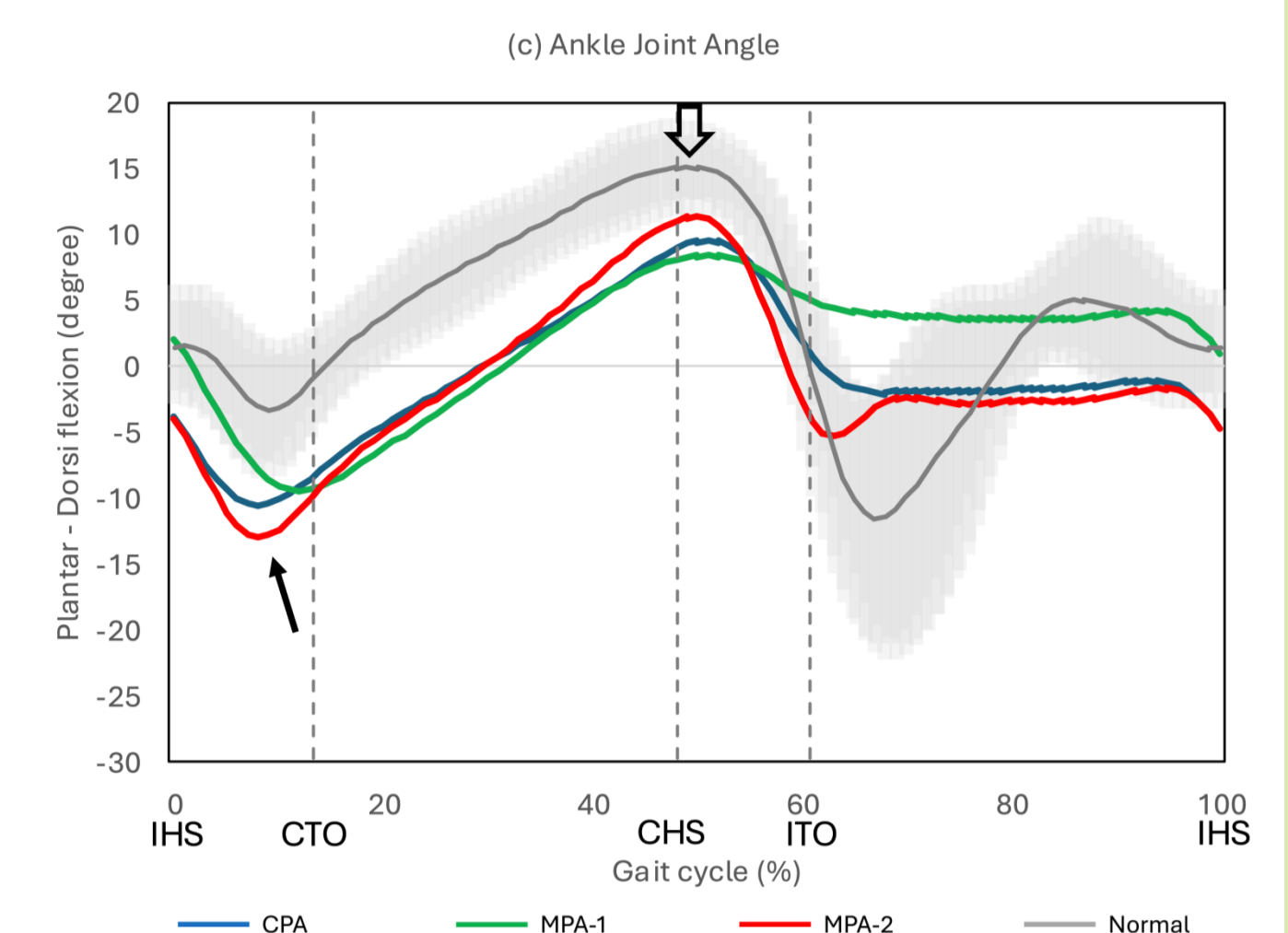


Figure 1.
Ankle Joint angle on amputated side

❖ Kinetics (Fig.2)

- ↑ Peak positive ankle power (amputated limb)

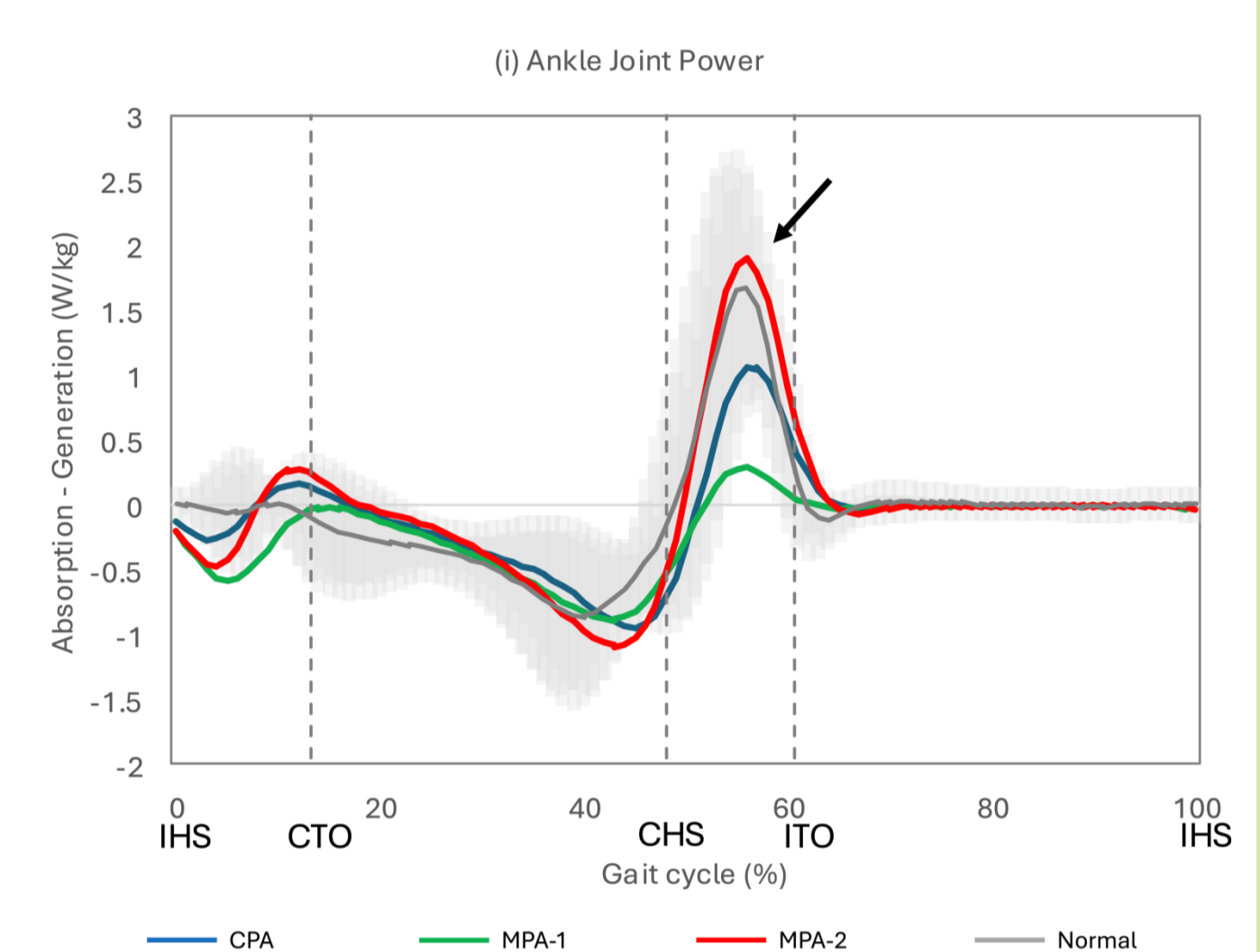


Figure 2.
Ankle Joint power on amputated side

❖ Ground Reaction Force

- ↑ Propulsion (vs MPA-1) (Fig. 3)
- ↓ Peak 1 vertical GRF on intact limb (vs CPA) (Fig. 4)

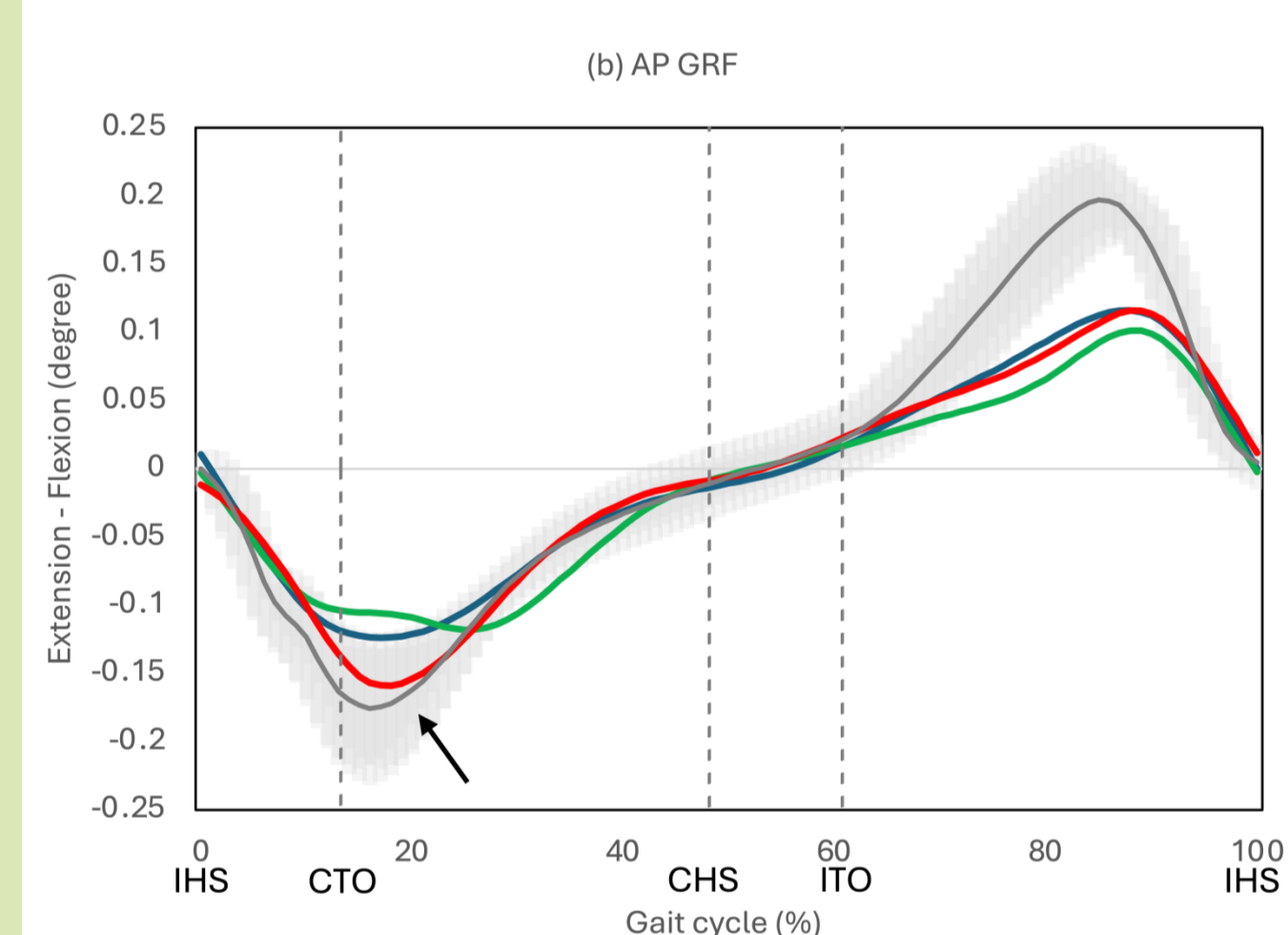


Figure 3.
AP GRF on amputated side

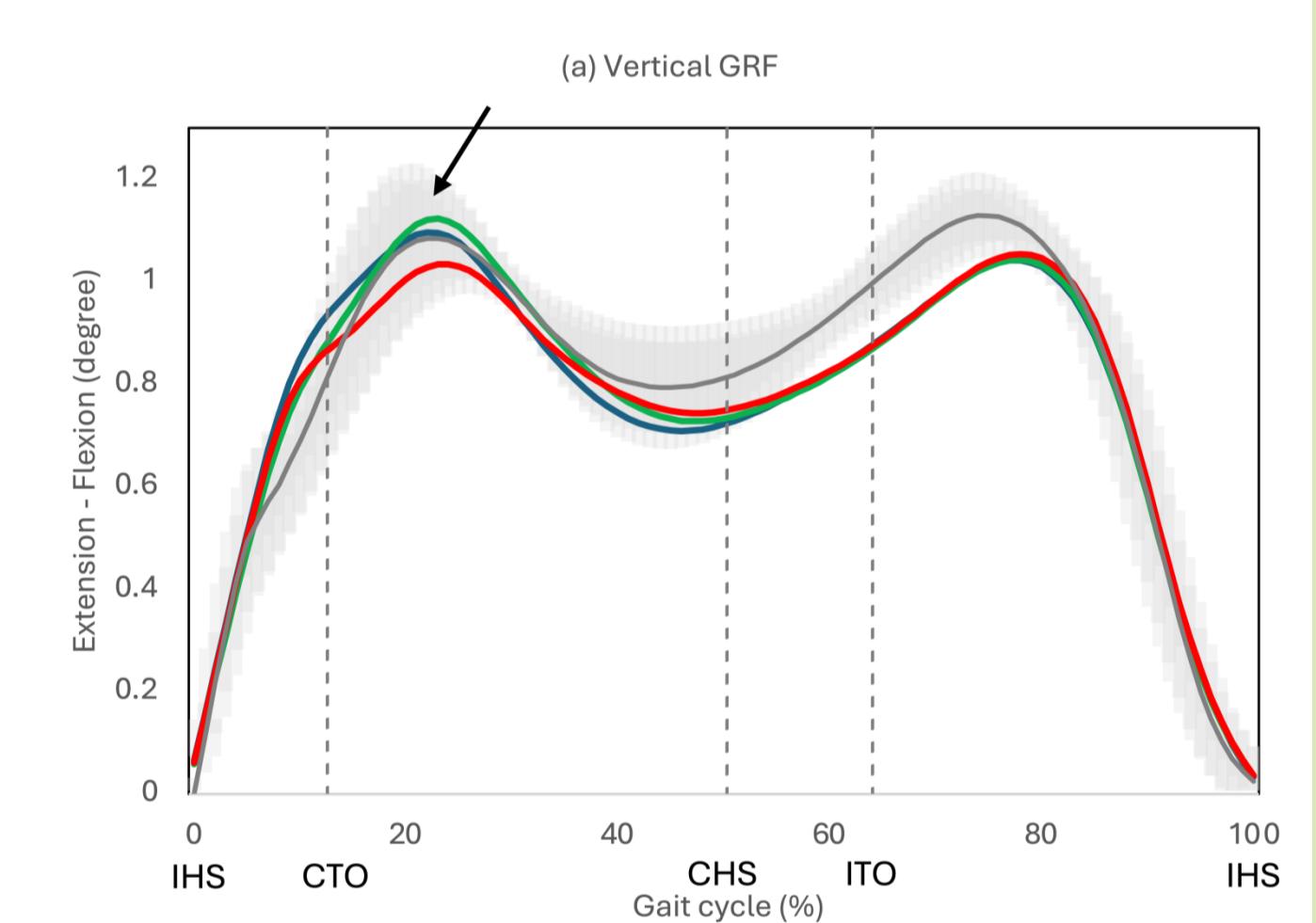


Figure 4.
Vertical GRF on intact side

❖ Symmetry

- ↑ Interlimb symmetry

❖ Energy Expenditure

- No significant differences

Conclusion

- ❖ MPA-2 improved **ankle motion, propulsion, and gait symmetry**
- ❖ Suggests a **more physiologic gait pattern**
- ❖ Despite limitations, clinical usefulness is supported

Take-Home Message

- ❖ **MPA-2 improves ankle motion and propulsion, leading to enhanced gait symmetry without increasing energy expenditure.**