

**5. Quantification of Reduced Power Output During Ambulation for Affected and Non-affected Limbs in Patients with Unilateral Claudication**

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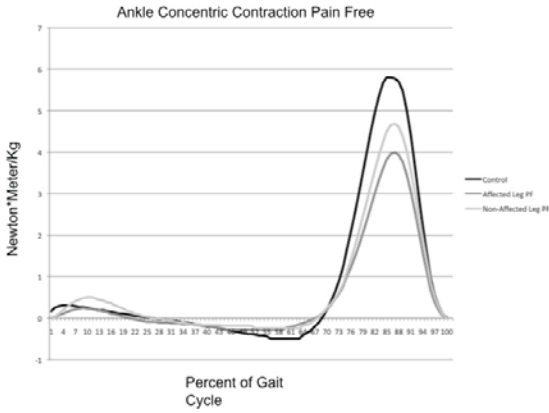
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**OBJECTIVES:** Symptomatic peripheral arterial disease (PAD) results in significant gait abnormalities. To quantify these gait alterations, we analyzed joint torques (rotational force) and powers (work/ time) of the lower extremity utilizing advanced biomechanical analysis.

**METHODS:** Twelve patients with unilateral PAD (age:  $58 \pm 7.9$  years, ABI: Affected Limb(AL). $59 \pm .25$ ; Non-Affected limb(NAL). $93 \pm .12$ ) and ten healthy controls(CON)(age:  $67.23 \pm 12.67$  years, ABI $>1.0$  all subjects) walked while kinetic and kinematic data were recorded. Data were collected for AL and NAL limb during pain free(PAD-PF) and pain induced (PAD-P) trials. Kinetics and kinematics were combined to quantify torques and powers at the hip, knee, and ankle joints.

**RESULTS:** In the PAD-PF and PAD-P state, the AL demonstrated significantly ( $p < 0.05$ ) reduced plantar flexion torque compared to CON. No significant differences were noted in torque production comparing the NAL to CON. In contrast, significant reduction in concentric contraction of the plantar flexors was noted for both the AL ( $P < .05$ ) and NAL ( $P < .05$ ) compared to CON for both the PAD-PF and PAD-P states (Table 1, Figure 1). No significant differences were noted when comparing the AL to NAL in the PAD-P and PAD-PF conditions for both torque and power. There was a significant reduction in total torque and power performed for both legs combined for plantar flexion when comparing the PAD-PF state compared to the PAD-P state ( $P < .05$ ). This corresponded with an increase in eccentric contraction ( $P < .05$ ) performed at the hip during midstance.

**CONCLUSIONS:** PAD patients with unilateral claudication during normal pain free ambulation have significantly altered plantar flexion in both the affected and non-affected leg. When patients experience pain with ambulation, the lower limbs in combination demonstrate significant reduction in the overall torque and power of plantar flexion with a corresponding increase in eccentric contraction at the hip during midstance. The current study continues to document significant gait abnormality at baseline in PAD patients localized to the plantar flexor muscles of the lower leg. Further studies should determine if these findings are dependent on location and severity of ischemia and whether revascularization reverses these deficits.



Ankle Joint Torques and Powers					
	Control	PAD-PF:AL	PAD-PF:NAL	PAD-P:AL	PAD-P:NAL
Joint Torque: Newton*M/ Kg	1.381+/- .15	1.183+/- .15*	1.284+/- .15	1.120+/- .26*	1.252+/- .26
Joint Power: Watts/Kg	5.734+/- 1.02	4.149+/- 1.08*	4.677+/- 1.25*	3.617+/- .92*	4.436+/- 1.15*

**NOTES**