Reference

Beil TL, Street GM, Covey SJ.

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Interface pressures during ambulation using suction and vacuum-assisted prosthetic sockets

Journal of Rehabilitation Research and Development 2002; 39(6):693–700.

Products

Vacuum-assisted socket system* (VASS) vs suction socket system (SSS)

TEC, later acquired by Otto Bock and sold as Harmony

Major Findings

With VASS compared to SSS:

→ **Positive pressure (compression of the residual limb) is reduced in stance phase**

Pressure impulse decreased by 7%

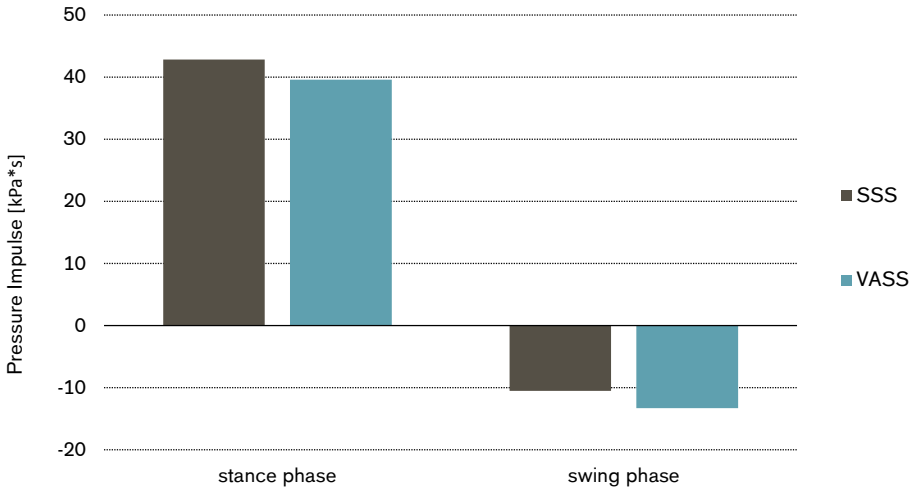
Peak pressure decreased by 4%

→ **Negative pressure (pull on the residual limb) is increased in swing phase**

Negative pressure impulse increased by 27%

Negative peak pressure increased by 27%

Decreased positive pressure impulse and increased negative pressure impulse with VASS



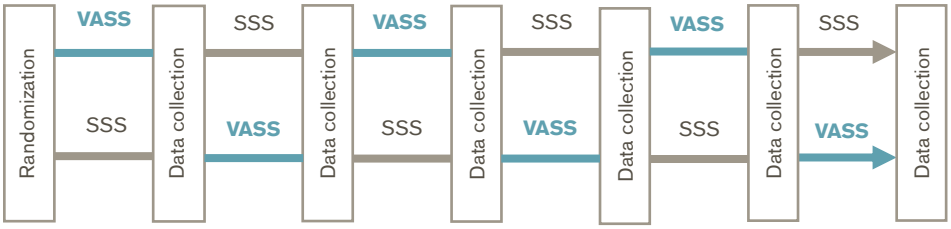
During stance phase pressure impulse values measured with five contact sensors. During swing phase values measured with one air pressure sensor. Measurements were conducted with a vacuum-assisted socket system (VASS) and with a suction socket system (SSS).

Population

Subjects:	9 unilateral, transtibial amputees
Previous socket system:	total-surface weight bearing socket
Amputation causes:	not reported
Mean age:	46 yrs (33 - 65 yrs)
Mean time since amputation:	18 yrs (6 - 32 yrs)
MFCL:	not reported

Study Design

Interventional, randomized crossover design:



Subjects walked 20 meters with one socket system, changed to the other socket system and walked 20 meters. This was repeated three times.

Results

Body Function				Activity			Participation	Others	
Wound Healing	Limb Volume Fluctuation	Pain	Comfort, Limb Health	Level Walking	Balance	Activity, Mobility, ADLs	Preference, Satisfac-tion, QoL	Pistoning	Pressure Measure-ment

Category	Outcomes	Results for VASS compared to SSS	Sig.*
Pressure Measurement	Data from 5 force-sensing resistors (for positive pressure) and 1 air pressure sensor (for negative pressure) during 5 steps at 4 km/h	Stance phase (compression of the residual limb):	
		Pressure impulse decreased by 7%.	++
		Peak pressure decreased by 4%.	++
		Swing phase (pull on the residual limb):	
		Magnitude of negative pressure impulse increased by 27%.	++
		Magnitude of negative average impulse increased by 25%.	++
		Magnitude of negative peak pressure increased by 27%.	++

* no difference (0), positive trend (+), negative trend (–), significant (++/––), not applicable (n.a.)

Author's Conclusion

"Use of the VASS changes the positive and negative pressures exerted on the residual limb during ambulation. Pressure impulse and peak positive pressures are reduced during the stance phase, while the magnitude of the impulse, average, and peak negative pressures is increased during the swing phase." (Beil et al. 2002)