

Harmony vs other socket systems

Pressure Measurement

Major Findings

With vacuum-assisted socket system (VASS):

→ **Positive pressure (compression of the residual limb) is reduced in stance phase compared to suction socket system**

Pressure impulse decreased by 7%

Peak pressure decreased by 4%

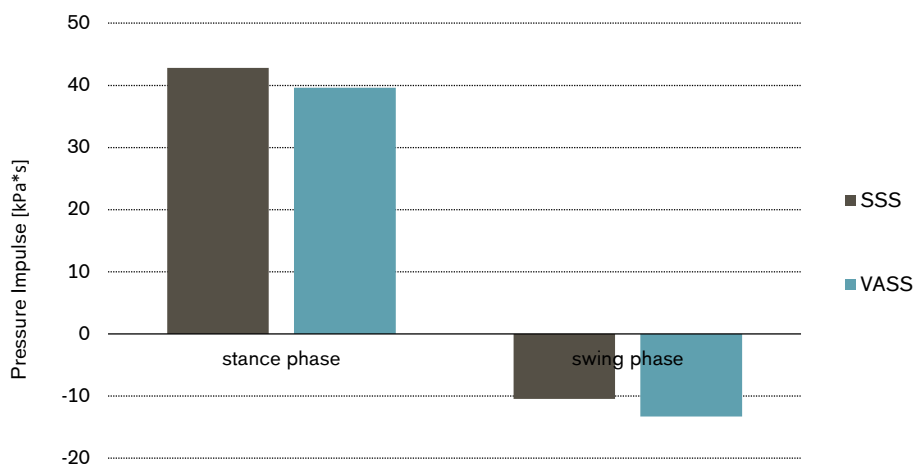
→ **Negative pressure (elongation of the residual limb) is increased in swing phase compared to suction socket system**

Negative pressure impulse increased by 27%

Negative peak pressure increased by 27%

→ **Medial brim pressure decreased by 41% with brimless compared to ischial ramus containment (IRC) socket design for transfemoral amputees**

Decreased positive pressure impulse and increased negative pressure impulse with VASS



During stance phase pressure (compression) impulse values and peak pressure values were measured with five contact sensors. During swing phase pressure (elongation) impulse values and peak pressure values were measured with one air pressure sensor. Vacuum-assisted socket system (VASS) was compared to suction socket system (SSS). (Beil et al 2002)

Clinical Relevance

External pressures applied to the skin affect the volume of the residual limb. Positive pressures decrease the volume of the limb (fluids are forced out) while negative pressures increase limb volume (fluids are drawn in). To maintain a proper fit during the day, it is important to keep volume fluctuations as minimal as possible.

Summary

With VASS positive pressure on residual limb is reduced in stance phase (Beil et al 2002) and therefore pushes less fluid out of the limb. During swing phase negative pressure is increased (Beil et al 2002) and more fluid is pulled into the limb. This combination prevents daily volume loss of the residual limb. As a result, the socket fit is more consistent.

A study investigating the effect on different socket types in combination with electronic VASS on transfemoral amputees, showed, that the medial brim pressure was

reduced by 41% with brimless compared to ischial ramus containment (IRC) socket design (Kahle & Highsmith 2014).

References	Year	Author	Title
	2014	Kahle	The effects of vacuum-assisted suspension on residual limb physiology, wound healing, and function: A systematic review
	2014	Kahle	Transfemoral sockets with vacuum-assisted suspension comparison of hip kinematics, socket position, contact pressure, and preference: Ischial containment versus brimless
	2002	Beil	Interface pressures during ambulation using suction and vacuum-assisted prosthetic sockets

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Kahle, J. T., Orriola J.J., Johnston W., & Highsmith, M. J. (2014). The effects of vacuum-assisted suspension on residual limb physiology, wound healing, and function: A systematic review. *Technology & Innovation*, 15(4), 333–341.

Kahle, J. T., & Highsmith, M. J. (2013). Transfemoral sockets with vacuum-assisted suspension comparison of hip kinematics, socket position, contact pressure, and preference: Ischial containment versus brimless. *Journal of Rehabilitation Research and Development*, 50(9), 1241–1252. doi:10.1682/JRRD.2013.01.0003

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