**Reference**

Goswami J, Lynn R, Street G, Harlander M.

Health, Physical Education, Recreation and Sport Science, St. Cloud University, Minnesota, USA

Walking in a vacuum-assisted socket shifts the stump fluid balance


**Products**

Vacuum-assisted socket system* (VASS)

*TEC, later acquired by Otto Bock and sold as Harmony

**Major Findings**

With VASS:

- Fluid balance of the residual limb is changed towards a net gain for all socket sizes and therefore a better fit of the socket is achieved

  - For under-sized socket, limb volume increased by 92 cc
  - For neutral socket, limb volume increased by 93 cc
  - For over-sized socket, limb volume increased by 58 cc

**Stump Volume Change**

Average changes in volume from the initial stump volume after 18 minutes walking in the under-sized, neutral and over-sized sockets. The predicted changes are based on the volume available to the stump in the respective sockets.

**Population**

Subjects: 7 transtibial amputees

Previous socket system: not reported

Amputation causes: Trauma or congenital

Mean age: 45 yrs (27 – 66 yrs)

Mean time since amputation: ≥ 3 yrs

MFCL: not reported
The study was designed to determine the effect of socket size on the stump volume fluctuation when walking. Therefore volume differences of -8% for under-sized, 0 for neutral and 8% for over-sized socket sizes from the liner volumes were investigated.

### Results

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#### Category

**Limb Volume Fluctuation**

- **Alginate casting method:** marked limb was casted in an alginate-water mixture. The impression of the stump thus formed, was filled with water. The volume of water determined the limb volume.

- **Post-walk stump volumes were increased relative to the volumes available in the sockets for all socket sizes:**
  - For undersized socket size stump volume increased by 92 cc
  - For neutral socket size stump volume increased by 93 cc
  - For oversized socket size stump volume increased by 58 cc

Therefore, the fluid balance of the stump was changed towards a net gain for all socket sizes.

#### Pain

- **Questioned about pain after walk with over-sized socket:**
  - No pain resulted from the volume gain following the walk in the over-sized socket.
  - ++

#### Comfort, Limb Health

- **Questioned about discomfort after walk with over-sized socket:**
  - No discomfort or reddening of the skin resulted from volume gain following the walk in over-sized socket.
  - n.a.

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

### Author’s Conclusion

“A custom-fit, VASS minimizes or prevents the acute volume loss normally observed after donning the recommended 4-6% under-sized socket. This shift in fluid balance ensures that a good fit is maintained during the day in ambulatory trans-tibial amputees.” (Goswami et al. 2003)