



POSITIVE OUTCOMES FOLLOWING USE OF VACUUM ASSISTED SUSPENSION IN TRANS-FEMORAL AMPUTATION. A CASE SERIES

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INTRODUCTION

Individuals with transfemoral (TF) amputation may benefit from socket systems using active vacuum pumps (VAC) to create and maintain pressure at sub-atmospheric levels. Preliminary research suggests that VAC may provide a more secure suspension and improve stability, weight bearing, comfort, perception, and limb health for those with transtibial amputation. Few studies have investigated VAC when applied to the TF amputee. Currently, there are no studies examining the change in one's daily life as a result of using a VAC socket system for the TF amputee.

METHOD

Subjects: Six with TF amputation participated. All have used current prosthesis for >12 months.

Apparatus: Balance and walking capacity; activity, participation, and quality of life questionnaires.

Procedures: At baseline, testing was performed with participants **EXISTING** socket and questionnaires completed regarding use of **EXISTING** socket. Participants were measured for a flexible inner socket with polypropylene rigid frame that achieved vacuum through use of the Otto Bock Harmony E2 pump with the Evolution Aura Sheath. Two weeks later participants were tested again with **EXISTING** socket. Following testing the **VAC** socket was fit, aligned on the participant's prosthesis (knee and distal), users were instructed how to use the system, and then went home. Participants returned 2 and 4-weeks later for testing using the **VAC** socket. Following the 4-week test participants went back into to their **EXISTING** socket and were asked which socket they preferred.

Data Analysis: Means for the 2 sessions with **EXISTING** and the 2 sessions with the **VAC** socket were calculated for each participant. Data is incomplete at various time points because of deviations from testing protocol due to individual socket modifications and participant health.

RESULTS

TABLE 1

	Balance Sway Composite Score (Lower the better)			Overall Limits of Stability Score (Higher the better)			6-Minute Walk Test (feet)			Amputee Mobility Performance Score (Higher the better)			Activity Balance Confidence (Higher the better)			Patient Specific Functional Score (Higher the better)			Prosthesis Evaluation Questionnaire (Higher the better)		
	EXISTING	VAC	% Change	EXISTING	VAC	% Change	EXISTING	VAC	% Change	EXISTING	VAC	% Change	EXISTING	VAC	% Change	EXISTING	VAC	% Change	EXISTING	VAC	% Change
S1	1.4	1.3	7%				644			37			64.3	71.3	11%	3.9	6.0	54%	5.1	6.7	31%
S2	2.1	2.1	0%	16.5	36.5	121%	481	493	2%	34	36	6%	35.9	62.2	73%	3.2	5.8	81%	4.6	6.3	37%
S3	1.5	1.8	-20%	32.0	40.5	27%	563	533	-5%	38	40	5%	35.6	60.5	70%	3.3	7.3	121%	3.7	7.3	97%
S4	1.2	1.2	0%	50.0	44.5	-11%	1477	1409	-5%	44	44	0%	37.5	49.7	33%	0.3	1.4	367%	3.1	5.9	90%
S5	1.5	1.4	7%	10.0	26.0	160%	958			42			68.8			4.3			5.4		
S6	1.1	1.1	0%	59.5	60.0	1%	1342	1402	4%	43	44	2%	87.3	91.3	5%	4.9	7.5	53%	8.3	9.3	12%

	Age (yrs)	Since amp (yrs)	Knee	RLL (cm)	Brim SI (cm)	Brim SI as % of RLL
S1	61	3 (Vasc)	C-Leg	31	3.0	90.4%
S2	80	2 (Vasc)	Til Knee	35	4.0	88.6%
S3	68	4 (Vasc)	C-Leg	26	3.0	88.5%
S4	26	2 (CA)	C-Leg	25	2.5	90.0%
S5	41	23 (Trauma)	C-Leg	33	0.0	--
S6	30	8 (Trauma)	C-Leg	22	0.0	--

For all **EXISTING** socket was ischial containment: 2 used suction, 4 used a laynard system. RLL: residual limb length = ischial tuberosity to distal end. SI: Subischium

As seen in Table 1, a positive change was noted in all patient reported outcome measures while minimal change was noted in balance and walking abilities. 4 of the 6 participants utilized a brim that was SI. Subjective comments from participants addressed improved comfort with the **VAC** socket.

All who have completed the protocol have opted to **stay in an active vacuum socket system**

DISCUSSION/CONCLUSION

In this case series, positive changes were noted using the **VAC** socket compared to the **EXISTING** socket. While the 4-week acclimation period may have been too short to result in improvements in balance or walking abilities, large improvements in perception of activity, participation and quality of life were noted supporting the use of **VAC** for TF amputation. These results can potentially help lead to policy change regarding reimbursement for **VAC** socket systems.

CLINICAL APPLICATIONS

Use of **VAC** sockets for TF amputation should be considered due to positive outcomes associated with activity, participation and quality of life when compared to **EXISTING** sockets.

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