A clinical comparison between two common transtibial Prosthetic suspension systems

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ABSTRACT

Introduction: Proper fitting of the stump inside the socket and appropriate selection of prosthetic suspension have positive effects on amputees’ satisfaction and could decrease gait deviation, skin problems, and stump atrophy. The suction sockets are commonly prescribed for transtibial amputees to have better suspension compared to the Pin and lock systems. The Seal-In® X5 (suction system) is a new suspension system that intend to decrease movement within the transtibial socket. The main intention of this study was to evaluate the effects of this liner on pistoning within the socket and patients satisfaction and to compare with a common pin and lock transtibial suspension system (Dermo liner).

Methods: Ten unilateral transtibial amputees participated in this work and two prostheses (with suction socket and Pin/lock) were fabricated for each of them. The vertical displacement within the socket in static positions and during the gait (dynamic) was measured using Vicon motion system. The subjects were also asked to complete a prosthesis evaluation questionnaire (PEQ) for each suspension systems.

Results: This study showed that the Seal-In could decrease pistoning movement inside the socket compare to the Pin and lock system. Moreover, during gait and static position a significant difference between the two suspension systems was found (p<0.05). However, this type of liner (seal-In) provided less pistoning during the ambulation but the overall satisfaction with the locking liner was higher (p<0.05) due to the relative ease with which the patients could don and doff the device.

Discussion and Conclusion: Amputation rehabilitation is influenced by appropriate choice of prosthetic components in accordance with the real needs of the individual. We can infer from
the results of this study that the Seal-In X5 liner decreased the pistoning within the prosthetic socket significantly, possibly as a result of the strong suction seal between the liner and the socket. Nevertheless, the subjects had difficulty with donning and doffing. We can therefore conclude that pistoning may not be the main factor that determines subjects’ overall satisfaction with the prosthesis. The study introduced a new method for evaluating the pistoning at the liner-socket interface in transtibial prostheses during gait. The Vicon system has the potential to detect the pistoning during gait while also offering a safer alternative to X-ray. Further studies are needed to come to a “gold standard” for pistoning.
References: