The Effect of Transtibial Prosthesis Suspension on Residual Limb Pistoning

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The main goal of transtibial prosthesis suspension is to minimize residual limb motion within the prosthesis. Poor suspension can lead to negative outcomes in prosthetic treatment, and may have a great impact on the mobility of an amputee. Prior research on this topic has focused on measuring pistoning by radiographic imaging of the residual limb in positions of simulated gait. Several suspension methods have previously been compared, but there is limited research on elevated vacuum suspension method. The purpose of this study is to investigate the effect of elevated vacuum suspension, standard suction with an expulsion valve, and knee sleeve suspension on residual limb pistoning. Five persons with unilateral transtibial amputations were recruited to participate in this study. Each subject was fit with a custom prosthesis that was easily converted between suspension methods. Dual energy x-ray absorptiometry DEXA scans were taken of the subjects' limb in the prosthesis under three different loading conditions to determine the amount of pistoning. Pistoning was measured as the difference between the half body weight loaded condition and the 44.5 N distraction force condition for each suspension. There was no statistical significance between the suspension methods determined using a repeated measures within subjects ANOVA. Future research should include addition of more subjects to increase the power and significance of this work. Another logical step would focus on measuring pistoning during dynamic activity.

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