



19th International Conference on Advanced
Computational Engineering and Experimenting
29 JUNE – 3 JULY 2026 | RHODES, GREECE

ABSTRACT:

Impact of the SCG Socket on Prosthetic Performance in Transtibial Amputees with Stump Damages

R. Suárez-Toscano¹, I. Soto-Ayala^{1,2*}

¹Universidad Iberoamericana Puebla, Unidad Territorial Atlixcáyotl, San Andrés Cholula, Puebla, México

²Instituto Politécnico Nacional - Escuela Superior de Ingeniería Mecánica y Eléctrica - Sección de Estudios de Posgrado e Investigación Edificio 5, 2do Piso, Unidad Profesional Adolfo López Mateos “Zacatenco” Col. Lindavista, C.P. 07738, Ciudad de México, México.

Email: rita.suarez.toscano@iberopuebla.mx, isaura.soto@iberopuebla.mx

Distal residual limb pain, recurrent skin lesions, and intolerance to distal weight bearing are frequent complications that significantly limit prosthetic performance in individuals with transtibial amputation. Conventional transtibial prosthetic sockets commonly rely on total contact designs that may allow some degree of distal load transfer, potentially aggravating these conditions in patients presenting adhered scars, bony prominences, neuromas, or compromised distal tissues.

This study evaluates the clinical impact of the SCG socket, a three-socket design developed to eliminate distal load transfer by maintaining the residual limb end free of contact while redistributing loads toward anatomically tolerant regions. A comparative observational study was conducted in transtibial amputees with documented distal limb pathology. Pain levels, tolerance to daily prosthesis use, presence of skin lesions, and basic functional performance parameters were evaluated before and after adaptation to the SCG socket during a follow-up period of 3 to 6 months.

Preliminary results showed a noticeable reduction in distal pain, increased daily prosthesis wearing time, and a decrease in recurrent skin lesions. Participants also reported subjective improvements in comfort and stability during ambulation. The proximal redistribution of loads demonstrated biomechanical advantages in patients presenting distal intolerance.

These findings suggest that the SCG socket represents a clinically viable alternative for transtibial amputees with distal residual limb compromise, contributing to improved prosthetic performance and patient quality of life. Further studies with larger sample sizes and instrumented pressure analysis are recommended to strengthen the scientific evidence supporting this approach.

Keywords: transtibial amputation, prosthetic socket design, distal load redistribution, residual limb pain.