

LOADING APPLIED ON THE ABUTMENT OF TRANSFEMORAL AMPUTEES FITTED WITH AN OSSEOINTEGRATED IMPLANT

L. Frossard^{1*}, D. Lee Gow², B. Contoyannis³, D. Ewins⁴, J. Sullivan⁵, R. Tranberg⁶, E. Haggstrom⁶, R. Brånemark⁷

¹Centre for Rehabilitation Science and Engineering, Queensland University of Technology, Brisbane

²Caulfield General Medical Centre, Melbourne

³RehabTech, Monash Rehabilitation Technology Research Unit, Melbourne

⁴Centre for Biomedical Engineering, University of Surrey, Guildford, UK

⁵Queen's Mary Hospital, Roehampton, UK

⁶Lundberg Laboratory for Orthopaedic Research, Gothenburg, Sweden

⁷Centre for Orthopaedic Osseointegration, Sahlgrenska University Hospital, Gothenburg, Sweden

This is the author-manuscript version of this paper. Published in:

Frossard, L and Lee Gow, D and Contoyannis, B and Ewins, D and Sullivan, J and Tranberg, R and Haggstrom, E and Branemark, R (2002) Loading Applied On The Abutment Of Transfemoral Amputees Fitted With An Osseointegrated Implant. In *Proceedings The Bone & Joint Decade 2000-2010 for Prevention & Treatment of Musculoskeletal Disorders. Multidisciplinary Research Day*, pages pp. 19-20.

BACKGROUND

Over the last ten years, a team led by Dr Rickard Brånemark attempted to alleviate concerns related to the socket of transfemoral amputees by developing a new method of attachment of their prosthetic leg based on a direct skeletal anchorage (Brånemark et al. 2001). In this case, the socket is replaced by an implant inserted into the shaft of the femur.

The design of the specific prosthetic components for these amputees might be refined with a better understanding of the actual load regime experienced by the implant. The purpose of this study was to provide the load applied on this implant during walking.

METHODS

The forces and moments were directly measured with a 3-axis transducer mounted between the knee and the implant (Nietert et al. 1998, Frossard et al. 2002). A total of 16 transfemoral amputees, representing 30% of the existing population, located around the Melbourne, London and Gothenborg areas participated to this study. Between 60 and 80 steps were measured for each amputee.

RESULTS AND CONCLUSION

For a subject of 92.1 kg walking at the cadence of 92 step/min, the absolute maximum value of the force on the antero-posterior, medio-lateral and long axes of the implant were respectively 229 N, 82 N and 841 N, while the moments were 39.8 N.m, 37.1 N.m and 6.6 N.m.

It is anticipated that the results presented in this paper will provide valuable information to the multi-disciplinary teams facing the challenge to safely restore the locomotion of transfemoral amputees fitted with osseointegrated implant.

REFERENCES

- Brånemark R, Brånemark P-I, Rydevik B, Myers R. Osseointegration in skeletal reconstruction and rehabilitation: A review. *J Rehabil Res Dev* 2001; 38(2):175-81
- Frossard L, Beck J, Dillon M, Evans J. Comparison between the forces and the moments applied on the residuum of above-knee amputees during daily life activities and walking. *Proceedings of 10th World Congress of the International Society for Prosthetics and Orthotics*. 2001 : MO10.3
- Nietert M, English N, Kreil P, Alba-Lopez G. Loads in hip disarticulation prostheses during normal daily use. *Prosthet. Orthot. Int* 1998;22:199-15.