INTRODUCTION
Bone-anchored prostheses, relying on implants to attach the prosthesis directly to the residual skeleton, are the ultimate resort for patients with transfemoral amputations (TFA) experiencing severe socket discomfort. The first patient receiving a bone-anchored prosthesis underwent the surgery in 1990 in the Sahlgrenska University Hospital (Sweden). To date, there are two commercially available implants: OPRA (Integrum, Sweden) and ILP (Orthodynamics, Germany).

The key to success to this technique is a firm bone-implant bonding, depending on increasing mechanical stress applied daily during load bearing exercises (LBE). The loading data could be analysed through different biomechanical variables. The intra-tester reliability of these exercises will be presented here.

Moreover the effect of increase of loading, axes of application of the load and body weight as well as the difference between force and moment variables will be discussed.

METHODS
Eleven individuals with unilateral transfemoral amputation fitted with an OPRA osseointegrated implant participated in this study. They performed five trials in four loading conditions (10kg, 20kg, 40 kg and a maximum depending on the body weight).

The forces and moments on the three axes of the implant were measured directly with a six-channel commercial transducer embedded in a short pylon (Figure 1).

Patients monitor the load applied by looking at a bathroom scale, getting information only on the load applied on the vertical axis.

RESULTS
The ICCs of all variables ranged between 0.947 and 1 and the %SEM values ranged between 0 and 87.07%.

The lowest ICC values and the highest %SEM values were found for the MLG and MML for the higher loads.

Figure 1: Overview of the apparatus used to monitor the load prescribed including the single-axis strain gauge (A) that was embedded in a support frame (B) and connected to a LCD display (C).

DISCUSSION
The %SEM is slightly higher for the moments than for the forces, especially for the MLG and MML in the higher loads (40kg and max load) indicating a slight decrease in the reliability for the moment on the long and mediolateral axis for the higher loads. Apart from these exceptions, the progression of the load prescribed, the axes of application and the body weight did have only limited impact on the reliability

CONCLUSIONS
The results indicate an overall high reliability between the loading conditions with little to no impact of the progression of the load prescribed, the axes of application and the body weight.
REFERENCES


INTRODUCTION

• Bone-anchored prostheses, relying on implants to attach the prosthesis directly to the residual skeleton, are the ultimate resort for patients with transfemoral amputations (TFA) experiencing severe socket discomfort. The first patient receiving a bone-anchored prosthesis underwent the surgery in 1990 in the Sahlgrenska University Hospital (Sweden).

• To date, there are two commercially available implants: OPRA (Integrum, Sweden) and ILP (Orthodynamics, Germany).1,2 The key to success to this technique is a firm bone-implant bonding, depending on increasing mechanical stress applied daily during load bearing exercises (LBE). The loading data could be analysed through different biomechanical variables.3,4 The intra-tester reliability of these exercises will be presented here.

• Moreover the effect of increase of loading, axes of application of the load and body weight as well as the difference between force and moment variables will be discussed.

METHODS

• Participants: Eleven individuals with unilateral transfemoral amputation fitted with an OPRA osseointegrated implant.

• Trials: Five trials in four loading conditions: 10 kg, 20 kg, 40 kg and a maximum depending on the body weight.

• Measurements:
  o What: forces and moments on the three axes of the implant (F_{ML}, F_{AP}, F_{LG}, M_{ML}, M_{AP}, M_{LG}).
  o How: directly with a six-channel commercial transducer embedded in a short pylon (Figure 1).5
  o Control: Patients monitor the load applied by looking at a bathroom scale, gathering information only on the load applied on the vertical axis.

• Statistical analysis: Reliability of the loading variables was assessed using intraclass correlation coefficients (ICCs), standard error of measurement values (SEMs) and %SEM values.

RESULTS

• Mean force applied was:
  o 79.03±57.54 N on the mediolateral axis,
  o 107.86±243.52 N on the anteroposterior axis,
  o 166.14±22.77 N on the long axis,
  o 223.97±26.19 N resultant.

• ICCs of all variables ranged between 0.947 and 1.

• SEM values ranged between 0 and 87.07%.

• The lowest ICC values and the highest %SEM values were found for the MLG and MML for the higher loads.

DISCUSSION

• The %SEM is slightly higher for the moments than for the forces, especially for the M_{ML} and M_{AP} in the higher loads (40 kg and max load) indicating a slight decrease in the reliability for the moment on the long and mediolateral axis for higher loads.

• Apart from these exceptions, the progression of the load prescribed, the axis of application and the body weight did have only limited impact on the reliability.

CONCLUSIONS

• Overall high reliability between the loading conditions.

• Little to no impact of:
  o The progression of the load prescribed,
  o The axes of application,
  o The body weight.

REFERENCES


TO KNOW MORE

  http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6856197

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