

The effect of body weight and age on frequency of repairs in lower-limb prostheses

Naseer H. J. Haboubi, MBCChB, MRCP; Michael Heelis, BSc; Ruth Woodruff, DIPT, MCSP;
Imad Al-Khawaja, PhD, MRCP

North Staffordshire Rehabilitation Centre, The Haywood, High Lane, Burslem, Stoke-on-Trent, ST6 7AG, UK; Sussex Rehabilitation Centre, Brighton General Hospital, Brighton, BN2 3EX, UK

Abstract—Introduction: Overweight patients sometimes present a practical problem for provision of lower-limb prostheses. Most information about the effect of body weight on the endurance of prostheses is based on laboratory tests. This is a retrospective study based on an audit to study the effect of body weight and age on the frequency of repairs. **Subjects:** One hundred and sixteen patients were involved (98 male), age 16–96 years, mean=58.7 years; weight 47–140 kg, mean=88 kg; 68 were transtibial amputees and 48 were transfemoral amputees. Causes of amputation were trauma (49), peripheral vascular disease (29), and others (38). Amputation was done 1–66 years prior to assessment, mean=13.66 years. Period of use of current prostheses was 0.5–28 years, mean=3.5 years. **Results:** One hundred and one repairs were done in a period of 6 months. The number of repairs was found to correlate significantly with weight (P value<0.001) and inversely with age (P value=0.003). No significant correlation was found between repairs and gender, cause of amputation, or level of amputation. **Conclusion:** Body weight and age of amputee are determining

factors in the frequency of repairs of lower-limb prostheses. However, a larger study for a longer period will be needed to confirm our finding.

Key words: *age, body weight, lower-limb prosthetics, repairs.*

INTRODUCTION

Obesity is a well-recognized complication in adults after lower-limb amputation and is more prevalent in those with transfemoral and bilateral amputations (1). The overweight patient sometimes presents a practical problem for provision of a prosthesis. Manufacturers have put weight limits on their components in order that the prostheses are used safely to the limits of their testing. Some manufacturers use a combination of weight and likely level of activity, for example, the Otto Bock Classification Matrix (2).

While weight is measured in the static phase, it is known that the weight load and the resulting movement on a prosthesis change during various stages of the gait cycle (3,4). The variability in the delivery and the fitting

Address all correspondence and requests for reprints to Dr. I. Al-Khawaja, Consultant in Rehabilitation Medicine, Sussex Rehabilitation Centre, Brighton General Hospital, Elm Grove, Brighton, BN2 3EX, UK; email: i.khawaja@src.org.uk.

of prostheses to patients, associated with variation of body weight and level of activity of those patients, implies that test load values obtained by experimental measurement must be confirmed by long-term monitoring of prosthetic performance (4).

OBJECTIVES

A retrospective study has been undertaken to evaluate the effect of body weight and age on the frequency and distribution of prosthetic repairs in lower-limb amputees.

METHOD

Retrospective analysis of the records of patients attending amputee rehabilitation clinics, between November 1995 and June 1996, has been undertaken. The parameters that were collected included:

1. Weight
2. Age and gender
3. Level of amputation
4. Number and types of repairs needed to different components
5. Causes of amputation
6. Time of amputation and the use of current prosthesis

STATISTICAL ANALYSIS

Poisson regression analysis was used. This method is suitable to analyze counted data (in our study: age, weight, and repair) in the presence of exposure (in our study: the period of use of current prosthesis (5)).

PATIENTS

A total of 116 patients were included in the study (98 male, 18 female), age 16–96 years (mean=58.7 years), weight 47–140 kg (mean=88 kg); 68 were transtibial amputees and 48 were transfemoral amputees. Causes of amputation were trauma (49), peripheral vascular disease (29), and others (38). Amputation was done 1–66 years

prior to assessment (mean=13.66 years). Period of use of the current prostheses was 0.5–28 years (mean=3.5 years).

RESULTS

There were 101 total repairs, which included the repair of the following components: ankle/foot (43), knee (18), suspension (7), socket (6), mechanical check (12), silence limb (10), and unspecified major repairs (6).

Weight was found to be a significant factor in determining the number of repairs when corrected for the period of use of lower-limb prosthetics. P value<0.001 (95 percent Confidence Interval=1.013169–1.0344708).

This significant correlation is also highly significant when corrected for the period since the amputation. P value=0.001 (95 percent Confidence Interval=1.006548–1.027687).

Age was found to be correlated inversely to the number of repairs when corrected for the period of the use of prosthetics (P value=0.003, Confidence Interval=0.9695178–0.9935601) and the period since amputation (P value=0.005, Confidence Interval=0.9687673–0.9945062). There are no significant relations between the number of repairs and the gender of amputee (P value=0.43), level of amputation (P value=0.44), and cause of amputation (P value=0.825).

DISCUSSION

This study constituted a clinical audit to review overweight patients and determine whether the service was monitoring them effectively and whether prosthetic components used by overweight patients would show significant wear when compared with components used by average-weight patients.

This study showed that the ankle/foot mechanism appeared to have sustained excessive wear in all patients. However, it was surprising to find that the number of repairs of the socket components is very low, which might be explained by poor documentation.

Traumatic amputees are usually young and overactive with heavy prosthetic use in employment and leisure. Therefore it was surprising to find that they have no more repairs compared with other amputees. The limited number of patients and short duration of the study might explain this.

Overall, this study showed significant differences in the numbers of repairs in prosthetic users according to weight and age, which indicates that young overweight patients might need prosthetics with high endurance to cope with their demands.

Another study, Datta et al. (6), a 10-year follow-up of lower-limb amputees, found that the prostheses of younger amputees required more repairs than those of older patients. However, this study did not investigate the effect of patients' weight on repair; in addition, the study participants were transtibial traumatic amputees exclusively (6).

To our knowledge, this is the first study about the relationship between body weight and frequency of repair of lower-limb prostheses. However, a further study involving more patients and longer follow-up and including activity level will be required to establish the relationship between body weight, age, activity level, and durability of prosthesis.

CONCLUSION

This study showed that body weight and age are significant factors in determining the frequency of repairs in lower-limb prostheses. Young, overweight amputees seem to have more prosthetics repairs, which may indicate the need to provide them with high-endurance pros-

thetics. Further study with a larger sample and longer duration, also assessing activity level, will be needed to confirm our findings.

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