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Original Research

Physical Activity in Adults with Diabetes Following Prosthetic Rehabilitation

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ABSTRACT

Objectives: To determine whether adults with diabetes and with transtibial amputations (TTAs) are meeting the recommended guidelines for physical activity intensity and daily step counts. The secondary objectives were to 1) to explore whether physical activity levels are maintained following discharge from prosthetic rehabilitation and 2) to determine whether clinical measures of physical function are associated with physical activity.
Methods: Adults ≥40 years of age with TTAs secondary to diabetes were recruited following discharge from prosthetic rehabilitation. Outcomes included accelerometer-measured physical activity (worn on the ankle of the intact limb), the 2-minute walk test, gait speed, the L-test and balance confidence. Assessments were conducted at 3 months (baseline) and at 9 months following discharge from rehabilitation. Analyses included paired sample t tests and Pearson correlation coefficients.
Results: The mean age for all participants (n=22) was 63±12 years. Participants took 3809±2189 steps per day at follow up, markedly lower than the 6500 steps per day recommended for older adults with chronic illness. Participants accumulated 24±41 minutes per week of moderate to vigorous physical activity, falling well below the recommended total of 150 minutes per week. An improvement was observed for performance on the L-test of functional mobility at follow up (–8.7 s±11.4; p=0.008). All other outcomes remained stable over time. Physical activity exhibited a good to excellent correlation with the 2-minute walk test distance (r=0.753; p<0.001) and gait speed (r=0.752; p<0.001) at discharge from rehabilitation.
Conclusions: Physical activity levels for adults with diabetes and TTAs remain stable following discharge from prosthetic rehabilitation but fall well below recommended guidelines of 6500 steps per day and 150 minutes of moderate to vigorous physical activity per week.

Mots clés :
complications du diabète de longue durée
prise en charge de la maladie
activité physique
fonctionnement physique
réadaptation

RÉSUMÉ

Objectifs : Déterminer si les adultes qui sont diabétiques et qui ont subi des amputations transtibiales (ATT) satisfont aux recommandations formulées dans les lignes directrices en matière d'intensité de l'activité physique et de nombre de pas quotidien. Les objectifs secondaires visaient à : 1) explorer si les niveaux d'activité physique sont maintenus après le congé de la réadaptation prothétique; 2) déterminer si les mesures cliniques du fonctionnement physique sont associées à l'activité physique.
Méthodes : Nous avons recruté les adultes ≥40 ans qui avaient subi une ATT secondaire au diabète après leur congé en réadaptation prothétique. Les résultats cliniques comprenaient la mesure de l'activité physique par l'accéléromètre (porté à la cheville du membre intact), l'épreuve de marche de 2 minutes, la vitesse de marche, le L-test et la confiance en leur équilibre. Nous avons réalisé des évaluations 3 mois (initiales) et 9 mois après le congé de la réadaptation. Les analyses comportaient des tests t pour échantillons appariés et les coefficients de corrélation de Pearson.

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Résultats : L'âge moyen de tous les participants (n=22) était de 63±12 ans. Les participants faisaient 3809±2189 pas par jour au suivi, soit un nombre nettement inférieur aux 6500 pas par jour qui sont recommandés chez les personnes âgées atteintes d'une maladie de longue durée. Les participants ont cumulé 24±41 minutes par semaine d'activité physique modérée à vigoureuse, se situant bien au-dessous du volume recommandé de 150 minutes par semaine. Au suivi, nous avons observé une amélioration de la mobilité fonctionnelle au L-test (–8.7 s±11.4; p=0.008). Tous les autres résultats cliniques sont demeurés stables avec le temps. Au congé de la réadaptation, l'activité physique a montré une corrélation bonne à excellente entre la distance de marche en 2 minutes (r=0.753; p<0.001) et la vitesse de marche (r=0.752; p<0.001).

Conclusions : Les niveaux d'activité physique des adultes qui sont diabétiques et qui ont subi des ATT demeurent stables après le congé de la réadaptation prothétique, mais se situent bien au-dessous des recommandations formulées dans les lignes directrices qui préconisent 6500 pas par jour et 150 minutes d'activité physique modérée à vigoureuse par semaine.

Introduction

More than 2.4 million Canadians are living with diabetes, and more than 20% of additional cases remain undiagnosed (1). The prevalence of diabetes is rising and is projected to affect almost 8% of the global adult population by 2030 (2). This growth is driven by a 69% expected increase in prevalence across developing countries, where the clinical consequences pose a considerable burden to healthcare systems (3). Lower-extremity amputations are among the most serious and costly complications of diabetes (4,5); in fact, dysvascularity with comorbid diabetes is well established as the leading cause of nontraumatic amputations, accounting for 50% to 70% of all cases (6,7). Canadians with diabetes are 20 times more likely to be hospitalized for lower-extremity amputations than their nondiabetic counterparts (1), underscoring the need for effective management strategies.

In Canada, current management for adults with diabetes following amputations includes a comprehensive course of rehabilitation that focuses on optimizing health through the restoration of mobility, functional independence and prosthetic use (8). Few studies have examined the transition from rehabilitation to community living, although clinicians have expressed concern that the functional gains made during rehabilitation may quickly diminish following discharge (9). Furthermore, despite any gains made, walking ability and balance confidence remain limited after discharge from prosthetic rehabilitation (10,11). This results in decreased social activity and overall physical activity in the community (12). Physical inactivity is associated with greater cardiovascular mortality among adults with diabetes (13) and has been shown to decrease steadily over time in this population (14). This highlights the need for interventions to improve engagement in physical activity in the community after rehabilitation.

The Canadian Diabetes Association guidelines recommend a weekly total of 150 minutes of moderate to vigorous physical activity for individuals with diabetes (15). This level of activity is associated with a reduced incidence of cardiovascular events, microvascular complications and all-cause mortality (16,17) and may counteract the adverse effects of diabetes. Individuals with marked functional limitations may achieve this target by repeated brief bouts of exercise throughout the week (15).

No study to date has examined the maintenance of physical activity levels in adults with diabetes and lower-extremity amputations immediately following discharge from intensive rehabilitation. Individuals with transtibial amputations (TTAs), 21 years after amputation, took 3395±1965 steps per day 6 months or longer after rehabilitation (18), which is well below the 9550 steps per day typically observed in healthy elderly adults (19). A systematic review of studies reporting activity levels of adults with a chronic illness recommended a minimum of 6500 steps per day (20). This target corresponds to the daily step count associated with the recommended level of physical activity energy expenditure, or 1500 kilocalories (kcal) per week (21).

Thus, the primary objective of this study was to determine whether adults with diabetes and TTAs meet recommended guidelines for activity intensity and daily step counts. The secondary objectives were 1) to explore whether physical activity levels are maintained following discharge from prosthetic rehabilitation and 2) to determine whether clinical measures of physical function are associated with objective measures of physical activity.

Methods

This study utilized a prospective, cross-sectional, repeated measures design. Individuals with diabetes were eligible for participation if they met the following inclusion criteria: 1) major unilateral transtibial amputation resulting from vascular deficiency; 2) prosthetic use, with or without gait aids; 3) being 40 years of age or older; and 4) being 3 months postdischarge from rehabilitation. Individuals were excluded if their prosthetic devices were transfer limbs or if they had significant lesions on the opposite limb. The study protocol was approved by the Joint Bridgepoint/West Park/Toronto Central Community Care Access Centre/Toronto Grace Research Ethics Board.

Descriptive measures

Descriptive measures included age, sex, use of a gait aid, comorbidities and quality of life according to the World Health Organization Quality of Life, short form (WHOQOL-Bref). The WHOQOL-Bref is a 26-item quality-of-life instrument (22) consisting of 4 domains: physical health (7 items), psychological health (6 items), social relationships (3 items) and environmental health (8 items) plus 2 overall quality of life and general health items. Individual items are scored on a scale of 1 to 5 to give domain scores and can be transformed into a standardized scale ranging from 0 to 100 (22), with higher scores indicating better quality of life. The scale has shown good discriminant validity, concurrent validity, internal consistency and test-retest reliability in general adult populations and in individuals with physical limitations and those in rehabilitation settings (22).

Assessment measures

Measures were assessed at 3 months (baseline) and at 9 months following discharge from rehabilitation. Baseline measures were taken 3 months following discharge to ensure that participants had learned to ambulate and that any issues with their prostheses had been resolved.