Eur J Vasc Endovasc Surg (2017) ■, 1–6

A Three Month Home Exercise Programme Augmented with Nordic Poles for Patients with Intermittent Claudication Enhances Quality of Life and Continues to Improve Walking Distance and Compliance After One Year

C. Oakley [a,*], **C. Spafford** [a], **J.D. Beard** [b]

[a] Sheffield Nordic Walking Research, STEPS Physiotherapy and Circulation Clinics, 32 Southbourne Road, Sheffield S10 2QN, UK
[b] Sheffield Vascular Institute, Northern General Hospital, Herries Road, Sheffield S5 7AU, UK

WHAT THIS PAPER ADDS

This paper confirms the long-term benefit of a three-month home exercise programme augmented with Nordic pole walking for patients with intermittent claudication. Weekly walking distance continued to improve out to one year and compliance was excellent. This is the first study to also show an increase in resting ABPIs after only three months. A large multicentre trial of an augmented Home Exercise Programme compared to existing (more expensive) Supervised Exercise Programmes is urgently required.

Objective/Background: The objective of this study was to collect 1 year follow-up information on walking distance, speed, compliance, and cost in patients with intermittent claudication who took part in a previously reported 12 week randomised clinical trial of a home exercise programme augmented with Nordic pole walking versus controls who walked normally. A second objective was to look at quality of life and ankle brachial pressure indices (ABPIs) after a 12 week augmented home exercise programme.

Methods: Thirty-two of the 38 patients who completed the original trial were followed-up after 6 and 12 months. Frequency, duration, speed, and distance of walking were recorded using diaries and pedometers. A new observational cohort of 29 patients was recruited to the same augmented home exercise programme. ABPIs, walking improvement, and quality of life questionnaire were recorded at baseline and 12 weeks (end of the programme).

Results: Both groups in the follow-up study continued to improve their walking distance and speed over the following year. Compliance was excellent: 98% of the augmented group were still walking with poles at both 6 and 12 months, while 74% of the control group were still walking at the same point. The augmented group increased their mean walking distance to 17.5 km by 12 months, with a mean speed of 4.2 km/hour. The control group only increased their mean walking distance from 4.2 km to 5.6 km, and speed to 3.3 km/hour. Repeated ANOVA showed the results to be highly significant ($p = .002$). The 21/29 patients who completed the observational study showed a statistically significant increase in resting ABPIs from baseline (mean $\pm$ SD 0.75 $\pm$ 0.12) to week 12 (mean $\pm$ SD 0.85 $\pm$ 0.12) ($t = (20) -8.89$, $p = .000$ [two-tailed]). All their walking improvement and quality of life parameters improved significantly ($p = .002$ or less in the six categories) over the same period and their mean health scores improved by 79%.

Conclusions: Following a 12 week augmented home exercise programme, most patients with intermittent claudication continued to significantly improve their walking distance and walking speed at 1 year compared with normal walking. Quality of life and ABPIs improved significantly after only 12 weeks and it is postulated that the improvement in ABPI was due to collateral development. These results justify the belief that an augmented home exercise programme will be as clinically effective as existing supervised exercise programmes, with the added benefits of lower cost and better compliance. Funding for a multicentre trial comparing an augmented home exercise programme with existing supervised exercise programme is now urgently required.

Article history: Received 12 September 2016, Accepted 1 February 2017, Available online XXX

Keywords: Ankle brachial pressure index, Exercise therapy, Home exercise programme, Intermittent claudication, Nordic pole walking, Nordic Poles, Peripheral arterial disease, Quality of life

* Corresponding author. STEPS Physiotherapy and Circulation Clinics, 32 Southbourne Road, Sheffield S10 2QN, UK.
E-mail address: stepsphysio@btinternet.com (C. Oakley).

1078-5884/

http://dx.doi.org/10.1016/j.ejvs.2017.02.025

INTRODUCTION

Nordic pole walking (NPW) has become an accepted form of exercise training for athletes, and is increasingly being used for patients with various conditions, including arthropathy and peripheral arterial disease (PAD). There is good

Please cite this article in press as: Oakley C, et al., A Three Month Home Exercise Programme Augmented with Nordic Poles for Patients with Intermittent Claudication Enhances Quality of Life and Continues to Improve Walking Distance and Compliance After One Year, European Journal of Vascular and Endovascular Surgery (2017), http://dx.doi.org/10.1016/j.ejvs.2017.02.025

evidence that NPW improves cardiovascular fitness in many patient groups, including those with intermittent claudication (IC),[1] and is a suitable form of exercise for the older population.[2] NPW results in an increase in oxygen use (23%) and calorific expenditure (22%) versus regular walking, without an increase in perceived exertion.[3] It feels easier than normal walking (NW) but works the cardiovascular system up to 23% harder, as more muscles are used. NPW involves a significant contribution from the arm and shoulder muscles, which aids forward propulsion. It increases stability, and also reduces the load on the spine and lower limbs when walking uphill or on the flat, compared with ordinary walking.[4] This may be an additional benefit as many patients with PAD are elderly and so have an increased incidence of arthritis.[5] Psychological mood enhancement has also been attributed to NPW.[6] Oakley *et al.* found that all patients with IC immediately walked further with poles.[7] The immediate increase in walking distance with poles is probably due to the decreased level of leg pain caused by the reduction in lower limb loading stress.[4]

A previous randomised controlled trial (RCT) was carried out to compare the benefits of a 12 week home exercise programme (HEP) of NW with one augmented by NPW in patients with IC.[8] Patients in the NPW group immediately walked further, both to claudication distance (CD) and maximum walking distance (MWD). CD and MWD continued to improve over the 12 weeks in both groups. Verbal feedback from participants indicated that the weekly telephone support, walking diaries, and pedometers helped considerably with self regulation and compliance during the study. The results showed that four weekly attendance for exercise testing was not required, as the telephone support was sufficient. Further investigation was needed to identify how significant these elements were to patient compliance in future studies and to investigate the impact on patient quality of life (QoL). Long-term compliance with home based exercise programmes in claudicants has been found to be low in previous studies.[9] Two studies were therefore carried out. The follow-up study looked at walking data and compliance after 6 and 12 months for the patients who had completed the original RCT.[8] The QoL study recruited a new observational cohort of 29 patients and compared resting ankle brachial pressure index (ABPI) and QoL before and after a 12 week HEP augmented with NPW.

The first objective of this study was to collect long-term follow-up information on walking distance, speed, and compliance in patients with IC who took part in a previously reported 12 week RCT of a HEP augmented with NPW versus controls who walked normally.[8] The second objective was to look at improvements in QoL and ABPIs in a new observational cohort of patients after the same 12 week NWP used in the original RCT.

METHODS

To be considered for the original RCT, patients were required to have had stable IC due to PAD (>6/12 duration of symptoms and a resting ABPI of <0.9), and be unsuitable for revascularisation or had no revascularisation procedure in the last 6 months.[8] The level of disease and unsuitability for revascularisation was determined by duplex ultrasound and/or magnetic resonance angiography. Patients were excluded if they had other conditions that could significantly compromise their walking distance (e.g., breathlessness or severe osteoarthrosis).

Thirty-two of the 38 participants who had completed the previous RCT were successfully contacted via telephone 6 and then 12 months after the end of the original study. In the NPW group, 17/19 were contacted successfully and in the NW group 15/19 participants were contacted successfully. At the end of the original study, all participants had been asked to continue using diaries and pedometers. Based on this information, they were asked a series of questions about their walking habits, and their weekly duration, frequency, and distance walked were recorded. The NPW group had been encouraged to continue to use their poles when walking and the control (NW) group to walk normally. No further support was given after the end of the original 3 month exercise programme.

A new observational cohort of 29 patients with IC were recruited for the QoL and ABPI study from the Sheffield Vascular Institute's outpatient clinics, over a 9 month period. The inclusion and exclusion criteria were the same as for the previous RCT.[8] The power calculation for the previous RCT indicated that 52 patients would be sufficient for a study involving two groups; therefore, for the QoL study it was deemed that more than 26 patients would give valid results. A proforma was used to record the demographic and clinical details, including age, sex, body mass index (BMI), duration of claudication, previous vascular interventions, level(s) of disease, and ABPI (Table 1).

Patients attended Steps Clinic and were taught NPW by a physiotherapist. The patients were asked to use NPW for at least 30 min three times per week in the community. Patients were given a pedometer (Yamaxx Digiwalker CW-700/701; www.yamaxx.com), which could record up to 7 days of activity, and diaries to keep a record of the date, time, and duration of each period of exercise, together with the number of steps shown on the pedometer. Patients were asked to complete a walking impairment questionnaire (WIQ) and a quality of life (EQ-5D) questionnaire at 0 and 12 weeks. ABPI at rest was taken at baseline and again at 12 weeks. Compliance was monitored by using the patient diaries and by attaching a pedometer during exercise. Support was provided by weekly telephone calls (included in the budget for the study). The diary entries and activity data were discussed and relevant advice was given. BMI was measured at 0 and 12 weeks as an index of calorific expenditure.

Data were analysed using IBM Statistics SPSS version 20 (IBM, Armonk, NY, USA). Descriptive statistics were obtained and tested for normal distribution using the Kolmogorov–Smirnov test. The diary walking distance data (MWD) and the EQ-5D scores violated the assumption of normality and could not be normalised using data

Please cite this article in press as: Oakley C, et al., A Three Month Home Exercise Programme Augmented with Nordic Poles for Patients with Intermittent Claudication Enhances Quality of Life and Continues to Improve Walking Distance and Compliance After One Year, European Journal of Vascular and Endovascular Surgery (2017), http://dx.doi.org/10.1016/j.ejvs.2017.02.025