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Clinical Column

A case study of recumbent cross-training in supervised exercise therapy for peripheral artery disease (PAD)

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INTRODUCTION

Treadmill walking is considered the gold standard modality for supervised exercise therapy (SET) for individuals with peripheral artery disease (PAD).[1] Many studies have shown the efficacy of this therapy for improving pain-free and total walking distance in those with lifestyle limiting claudication.

Prior to the Centers for Medicare and Medicaid Services (CMS) decision in 2017 to provide reimbursement for SET programs, the majority of patients with PAD could only participate in exercise programs through participation in research trials that were comparing exercise to another treatment option or a 'usual care' condition. Therefore to be eligible for participation in those trials it was usually required that they were able to walk in a treadmill at a speed of at least 2 miles per hour. However, in clinical practice, patients participating in SET programs may be less fit and/or have more complications compared to their research participant counterparts. In our experience implementing SET in a rural healthcare system, we found that patients referred to SET had many competing health conditions and comorbidities. It seems that many of these individuals and others currently being referred to SET would likely not have qualified to participate in those clinical trials for PAD and exercise because they could not meet the study inclusion criteria. Therefore, there may be a mismatch between those who were studied in the clinical trials and those who are referred to clinical SET programs. The result is that patients referred to SET may be uncomfortable or unable to perform treadmill walking exercise. Alternative modes of exercise, such as the upper body ergometer or recumbent cross trainer (NuStep) may be ideal options for individuals with PAD who are particularly frail or physically limited. These modes of exercise are performed in a seated position and may be safer for many patients with PAD.

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CASE

We present a case of a 78-year-old male ("Stan") with a history of PAD, previous aortobifemoral bypass, and endovascular revascularization with multiple stents who was referred to SET in a rural Midwest health system. His comorbidities include chronic systolic heart failure, atrial fibrillation, carotid stenosis, depression, hypothyroidism, and benign prostate hyperplasia. His risk factors include hypertension, hypercholesterolemia, and age.

After bypass and revascularization, his ABIs were 0.84 (previously 0.57) on the right and 0.70 on the left. Angiography showed complete occlusion of both superficial femoral arteries and upper popliteal artery occlusion on the left. Despite engaging in a walking program on his own and participating in cardiac rehabilitation, his PAD resulted in progressive loss of his strength and independence. His symptoms, which he described as bilateral weakness, limited his ability to rise from a chair, drive his truck, go places alone, and walk for more than half a block at a time. Eventually, he required assistance from his significant other to rise from a chair. He even required the help of the fire department to help him off the toilet, when his partner was not there to help him. He shared a story with us about his love of trees and how he used to walk in the woods outside of his cabin before he had PAD and knew each tree by name. As his disease worsened, he did not walk into the woods anymore. Eventually, he did not walk much at all. He said he had to look out at the forest from his porch and could no longer visit the individual trees. This story illustrates the toll that PAD takes on people's lives and how this disease took away this individual's independence.

INITIAL PRESCRIPTION

Upon enrollment in SET, Stan was concerned he would not be able to perform treadmill exercise. Given his age and frailty, he was started on the NuStep, as his primary mode of exercise and also performed one bout of treadmill walking at 1.0 and 0% grade. The exercise therapist encouraged him to try at least one bout of treadmill walking each session. His initial prescription was the NuStep (level 1, 12 watts for 10 minutes). During his second session, he again did a 10 minutes bout on the NuStep, followed by two walking bouts at 1.1 miles per hour and 0% grade. The treadmill bouts were four minutes each and required four and five minutes of rest, respectively, for symptom resolution. His family drove him to all his therapy sessions initially, as he required assistance getting in and out of their truck and into the building due to his leg symptoms.

EXERCISE PRESCRIPTION PROGRESSION

Stan consistently denied classic symptoms of claudication, however, he experienced profound weakness in the quadriceps and calves that required him to stop walking on the treadmill. Despite needing to stop due to leg symptoms, he would often rate his symptoms as a "0", or "no pain or discomfort" up to a "2" or "mild" on a 0–5 claudication scale. The most common target claudication rating for most symptom limiting treadmill walking exercise prescription is for patients to walk to moderate claudication (3 to 4 on a 5-point scale). Thus, this was a lower rating than would be expected based on his bout durations and need to stop.

Given the fact that Stan reported "no" or "mild" leg symptoms and because he was also significantly deconditioned from a cardiovascular perspective, the main goal of therapy was to simply improve his overall fitness level. Each week, the exercise therapist prescribed longer exercise bouts at higher intensities on the NuStep. The NuStep was the primary exercise modality since it allowed him to accumulate more aerobic exercise compared to the treadmill. Despite his low time and intensity on the treadmill, he was instructed to try to perform two bouts of treadmill walking each session to help build his confidence with walking. He was never able to consistently walk longer than 4–5 minutes at 1.0–1.4 mph and 0% grade. Had he been given only treadmill walking for his exercise prescription, the dose he could tolerate would have been at a sub-aerobic threshold and, therefore, potentially less therapeutic. On the NuStep, he was able to gradually increase the dose of exercise per session by adjusting the level, the steps per minute, and bout duration at a rate heavy enough to provide a cardiovascular stimulus, gentle enough to tolerate the symptoms, and safe enough to prevent falls.

ACTIVITY MONITORING

Patients in the SET program at this facility were given Garmin Vívofit activity trackers to help monitor their physical activity outside of SET. A Vívohub was set up at a central location in the cardiac rehabilitation facility and programmed to automatically synchronize watch data to the patient's personal account. At the beginning of SET, Stan was sometimes accumulating fewer than 1,000 steps in a 24-hour period. He began tracking his exercise around the house, but particularly around stores he frequented and found that he could accumulate approximately 1,000 steps for each large retail store he visited. He progressively increased his outside physical activity to approximately 3,000–4,000 or more steps per day using the Vívofit activity monitor.

OUTCOME

Thanks to a rural outreach grant funded by the Margaret A. Cargill Foundation, the cardiac rehabilitation staff, and Stan's determination, he continues to attend SET three times a week, two years and eight months after first enrolling in program. At the end of the grant period, he made a plan to maintain his exercise program by utilizing CMS SET benefit and the phase III self-pay program offered through this facility. He continues to wear his activity monitoring device and keeps track of his daily step count. At the end of the grant period, he was no longer limited in his ability or willingness to get in and out of a chair. Although his leg symptoms persist, he is able to accumulate 45 minutes of exercise three times a week; 35 minutes on the NuStep and two five-minute bouts on the treadmill. While his treadmill walking has not increased significantly since starting SET, his NuStep prescription has increased from level 1 to level 5, exercising at a 2.8–3.5 MET level compared to 1.8 at baseline. He has resumed driving and attends his exercise sessions independently, without the need for a family member to assist him.

CONCLUSION

This case demonstrates that the recumbent cross-trainer (NuStep) can offer additional possibilities for patients with PAD as a feasible, safe, and effective exercise modality for improving PAD symptoms and overall cardiovascular fitness. Adults with an increased risk of falling, fear of falling, or unable to tolerate longer bouts on the treadmill could benefit from using the NuStep as the primary exercise modality in SET. No studies have compared the efficacy of NuStep therapy to the gold standard, treadmill walking. Further research is needed to elucidate the differences in effectiveness and utility of recumbent cross-training for the treatment of symptomatic PAD.

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