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Peripheral Arterial Disease

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Peripheral arterial disease (PAD), also known as peripheral artery occlusive disease, is the most common form of peripheral vascular disease (PVD), with an estimated 8-12 million American adults who are affected [7]. Health and fitness professionals may see a rise in the number of exercisers with PAD as the benefits of exercise in this population become better known. Therefore, fitness professionals must be aware of the possible exercise limitations of this population, as well as their health goals and the benefits that can be achieved through physical activity (PA) and patient education.

Peripheral arterial disease is characterized by occlusion of arteries in the limbs due to endothelial dysfunction and atherosclerosis in the vascular beds of the lower extremities [7]. Inadequate circulation to the legs, or limb ischemia, especially during PA can cause painful and physically limiting leg pain, known as intermittent claudication. Consequently, individuals with intermittent claudication have ambulatory dysfunction that affects their ability to carry out activities of daily living and can inhibit their ability and desire to exercise, which negatively affects their health risk profile for other cardiovascular diseases [1]. Exercise may improve the clinical outcome of patients with PAD by improving their risk profile. Therefore, it is critical that PA not only be encouraged, but that exercise be supervised to ensure proper safety and program maintenance.

RISK FACTORS

Because atherosclerosis has already affected the vasculature of the lower limbs in those with PAD, it is likely that these individuals may also develop atherosclerosis in coronary and/or cerebrovascular arteries as well. Lifestyle modification including regular PA can help manage risk factors and may help slow progression of such diseases. The health fitness professional can help by encouraging regular physician visits, motivate the patient to stay committed to PA / risk modification goals, and raise patient awareness through education.

DIABETES

Diabetes is the number one risk factor for peripheral vascular disease and puts individuals at a 1.5 to 2.0 times greater risk of developing PAD than those without diabetes [2]. Tight glucose control (maintaining healthy blood sugar levels) in those with diabetes with PAD may be a method to deter the progression or severity of the disease. Therefore, the American Diabetes Association recommends that HbA1c levels be <7.0 in the population [2].

SMOKING

In persons >45 years of age, the estimated risk of developing intermittent claudication is up to 16-fold higher among smokers than among nonsmokers, making this the number one modifiable risk factor [7]. Smoking cessation programs, where appropriate, can be an important component to a patient education plan.

BLOOD PRESSURE

In a Framingham Heart Study follow up, a positive association between hypertension and claudication pain was reported [11] and may be important to manage claudication pain [2]. The Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure recommends that blood pressure be maintained less than 130/80 mmHg for those with cardiovascular disease [5].

HIGH CHOLESTEROL

According to the National Cholesterol Education Program Adult Treatment Panel (NCEP ATP-III), LDL should be no higher than 100 mg/dL and HDL \geq 60mg/dL for individuals with cardiovascular disease [6]. For individuals with high triglycerides (\geq 200mg/dL), ATP III advises that non-HDL cholesterol be 30 mg/dL higher than the LDL goal [6].

CLAUDICATION PAIN

The severity of PAD is many times classified by level of claudication pain experienced by the patient. The Fontaine classification system is used to organize the intensity of claudication to a stage of the disease progressing from mild to severe [9]. In stage 1, patients are asymptomatic, stage 2 patients experience intermittent claudication, stage 3 is characterized by claudication pain at rest, and stage 4 patients experience gangrene leading to possible amputations. Exercise specialists most commonly work with Stage I and II patients. Stage III and IV patients require more aggressive treatment such as revascularization. However, exercise may play an important role in their rehabilitation and risk factor modification. The risk of cardiovascular death increases with the severity of claudication [11]. Therefore, individuals who are beyond stage II are at the highest risk for cardiovascular disease related deaths. This is incentive for patients in Stage I or II and their exercise professionals to aggressively help manage risk and improve claudication. Unfortunately, many people with diabetes are at increased risk for PVD and may unknowingly already have asymptomatic Stage I PAD. This is

another reason why it is crucial for those with diabetes to remain or become physically active and be screened regularly to prevent progression of the disease.

Table 1: ACSM Claudication Pain Rating Scale

1. Minimal Discomfort
2. Moderate Pain (patient can be distracted)
3. Intense Pain
4. Unbearable Pain

Adapted from ACSM's Guidelines for Exercise Testing and Prescription, 7th ed. Philadelphia, PA: Lippincott Williams & Wilkins,

EXERCISE/PHYSICAL ACTIVITY

An exercise prescription for patients with PAD should focus on management of risk factors [3, 8] similar to a patient with CHD [1] and aim at improving functional mobility to help the individual accomplish activities of daily living while improving intermittent claudication. Aerobic exercise, such as walking, has been utilized as a means to increase VO₂ PEAK, as well as pain free walking distance in patients with PVD with improvements seen in the onset of claudication time and time to maximal claudication pain [12]. Time to onset is the moment during exercise when the patient begins to experience discomforting leg pain. Time to maximal claudication pain is the amount of time it takes the patient to experience severe enough leg pain that they are unable to continue exercise. Exercise interventions have also shown promise in increasing peripheral adaptations, such as increased capillary density, oxidative enzymes [10] and central adaptations (e.g., stroke volume) [12, 10].

It also has been suggested that another possible response to exercise training is an increase in pain tolerance [12]. As participants become acclimated to the pain, they may be able to work through it more effectively. When considering the level of pain that must be tolerated during exertion, plus the fact that the participants are usually unaccustomed to exercise, encouragement to persist with the exercise rehabilitation can become an important factor for exercise adherence and long-term success.

EXERCISE PRESCRIPTION

Typically, patients with PAD are considered high risk and require medical clearance before starting an exercise program. Most will also require monitoring during exercise (i.e., blood pressure and heart rate). Consistent with the American College of Sports Medicine (ACSM) guidelines, PAD patients should engage in cardiorespiratory exercise three to five days/week. Patients should walk at a speed and incline that elicits claudication symptoms within three to five minutes and then continue to walk until they reach symptoms of moderate claudication [1]. The ACSM claudication pain rating scale (Table 1) may be a useful tool during training, keeping the claudication pain at a moderate level (2 on the ACSM scale) [1].

The initial duration should include 35 minutes of walking time; however, duration may start at 15 minutes for more severely affected patients and may include intervals if claudication pain is severe (≥ 3 on ACSM scale). Duration should increase five minutes each session until 30-50 minutes (preferably continuous) of walking time can be accomplished. The exercise intervention should last for at least six months in order to see improvements in walking distance. Intensity should be in the range of 50% – 80% VO_2 PEAK or VO_2 MAX (if max known) or 55% – 90% HRR.

Cycling can be used as a warm up or cool down; however, it should not be used as the main mode of exercise because it does not elicit claudication pain and subsequent stimulus for claudication improvements [10]. Similarly, the Upper Body Ergometer can be a useful exercise modality for managing risk factors and increasing cardiorespiratory fitness without the burden of claudication pain. Claudication pain may not improve, but walking ability may improve due to increases in stroke volume [12].

Resistance training (RT) programs consisting of exercises in the lower extremities may not be effective at improving claudication pain. One study found that RT was less effective than treadmill training in improving peak treadmill walking time and did not result in increased VO_2 PEAK or onset to claudication pain [4]. However, since RT does help maintain lean muscle mass and increase bone density to prevent osteoporosis, it should be included as part of a well designed fitness program for PAD patients and should follow ACSM Guidelines for general population [1].

PAD AND SUCCESSFUL OUTCOMES

Collectively, regular exercise would result in an improved quality of life [3]. It is necessary to improve functional capacity (VO_2 PEAK/MAX) in these patients because while performing everyday activities, they may be working at their maximal work capacity, become fatigued and stop more readily, which would only perpetuate the progression of the disease and complications [10].

Exercise programs should focus on risk factor reduction and improvement of walking distance to claudication. By reducing risk factors and claudication pain, patients may experience greater independence in their ability to perform activities of daily living, as well as a decreased risk of comorbidities. With appropriate supervised exercise and educational programs, exercise specialists and PAD patients or those at risk for PAD, can work together to achieve health and fitness goals that enable patients to live an independent life with successful clinical outcomes.

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