Exercise as medicine: Role in the management of primary hypertension

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Abstract: Primary hypertension affects 1 in 5 Canadians and significantly increases the risk of myocardial infarction, stroke, heart failure, and early mortality. Guidelines for the management of hypertension recommend lifestyle modifications (e.g., increased physical activity, smoking cessation, moderate alcohol consumption, improved dietary choices) as the frontline strategy to prevent and manage high blood pressure (BP). In particular, acute and chronic aerobic exercise has consistently been shown to reduce resting and ambulatory BP, with the largest effects in hypertensive patients. Current guidelines recommend 30–60 min of moderate-to-vigorous-intensity aerobic exercise 4–7 days per week, in addition to activities of daily living. The role of resistance training in the management of hypertension is less clear, although available data suggests resistance exercise can be performed safely without risk of increasing BP or adverse events. Presently, resistance exercise (8–10 exercises, 1–2 set(s) of 10–15 repetitions, 2–3 days/week) is advocated only as an adjunct exercise modality. Patients desiring to begin an exercise program should complete the Physical Activity Readiness Questionnaire (PAR-Q or PAR-Q+) or as required, the Electronic Physical Activity Readiness Medical Examination (ePARmed-X) or Physician Clearance Form in consultation with their clinician and (or) trained exercise professional. A greater emphasis on utilizing exercise as medicine will produce positive nonpharmacologic benefits for hypertensive patients and improve overall cardiovascular risk profiles.

Key words: hypertension, aerobic exercise, resistance exercise, training, blood pressure.

Introduction

Primary hypertension, a resting blood pressure (BP) >140 mm Hg systolic and (or) >90 mm Hg diastolic, remains one of the most prevalent modifiable risk factors for cardiovascular disease (James et al. 2014). Hypertension is estimated to affect 1 in 5 Canadians (Robitaille et al. 2012) and increases the risk of myocardial infarction, stroke, heart failure, and early mortality (James et al. 2014; Robitaille et al. 2012). The disease burden is magnified by a high residual lifetime risk (upwards of 90%) and suboptimal rates of awareness and control (Chobanian et al. 2003). The Eighth Joint National Committee (JNC 8) recently released updated evidence-based guidelines for the management of high blood pressure in adults (James et al. 2014), which again recommend the initiation of lifestyle modifications (e.g., improved dietary choices, smoking cessation, moderate alcohol consumption, stress management, increased physical activity) as frontline interventions for the prevention and management of hypertension. In light of these updated guidelines, we will highlight the current state of recommendations, and evidence supporting the prescription of aerobic and resistance exercise to reduce BP.

Aerobic exercise

The Canadian Hypertension Education Program, American College of Sports Medicine, and American College of Cardiology/American Heart Association each advocate that normotensive patients (for primary prevention of hypertension) and hypertensive patients (needing to reduce their BP in secondary prevention)
should engage in 30–60 min of moderate- to vigorous-intensity aerobic exercise 4–7 days per week and beyond their regular activities of daily living (Brook et al. 2013; Eckell et al. 2013; Fletcher et al. 2001; Hackam et al. 2013; Pescatello et al. 2004). These recommendations produce both acute and chronic benefits on resting and ambulatory BP.

Acutely, a single bout of aerobic exercise can produce a period of postexercise hypotension (PEH) sufficient to reduce 24-h ambulatory BP by ~3.2–1.8 mm Hg (Pescatello and Kulikowich 2001), though larger reductions (~8–14/~7–9 mm Hg) can be found earlier in recovery (MacDonald 2002). Considerable heterogeneity in interindividual responses exists, with PEH most consistently reported in prehypertension and hypertension patients (i.e., in those with higher baseline BP) (Pescatello et al. 2004; MacDonald 2002). In addition, the magnitude of the PEH response may predict the degree of the BP lowering from aerobic exercise training (Liu et al. 2012). Exercise intensity and duration are considered important determinants of the PEH response (MacDonald 2002), although reductions in BP have been observed following low-intensity aerobic exercise (Blanchard et al. 2006), short incremental bouts of exercise (Park et al. 2006), and interval exercise (Lacombe et al. 2011). Importantly, these acute effects are capable of attenuating subsequent pressor responses to stress (Hamer et al. 2006).

Consistent evidence also supports the role for aerobic exercise training to reduce resting BP (Cornelissen and Fagard 2005; Cornelissen and Smart 2013; Pescatello et al. 2004). Meta-analyses of randomized controlled trials demonstrated weight net reductions in resting BP between 3.0–3.5/2.4–2.5 mm Hg, with larger effects observed in hypertension patients (~6.9–8.3/~4.9–5.2 mm Hg) (Cornelissen and Fagard 2005; Cornelissen and Smart 2013). Similar magnitude reductions of 3.3/3.5 mm Hg are observed for ambulatory BP (Cornelissen and Fagard 2005). High-intensity interval training appears equally effective as continuous aerobic training at reducing resting and ambulatory BP (Guimarães et al. 2010). Based on the current level of evidence, Canadian guidelines advise that participating in high-intensity aerobic exercise is not expected to produce any additional BP benefit compared with moderate-intensity aerobic exercise (Hackam et al. 2013). A wide variability in aerobic training responses exists, with an estimated 25% of individuals not experiencing significant reductions in BP (Hagberg et al. 2000). This may be influenced by the specific training characteristics (frequency, intensity, duration, type), and individual genetic and pathological profiles.

Resistance exercise

Most guidelines recommend a noncompeting adjunct role for resistance exercise, incorporating 1–2 set(s) of 10–15 repetitions for each major muscle group (8–10 exercises) on 2–3 days per week (Brook et al. 2013; Pescatello et al. 2004; Williams et al. 2007). Available studies demonstrate that a single session of resistance exercise can produce PEH (Gomes Anuncião and Doederlein Polito 2011), even at low-intensities (Melo et al. 2006). However, acute reductions in ambulatory BP have only been reported in hypertensive patients (Hardy and Tucker 1998; Melo et al. 2006).

Although some meta-analyses demonstrate that resistance training is associated with a reduction in resting BP of 1.8–3.5/3.2 mm Hg (Cornelissen et al. 2011; Cornelissen and Smart 2013), this analysis is not universal. Recently, a more stringent meta-analysis of high-quality trial evidence reported that resistance training had no effect on systolic BP and smaller overall reductions in diastolic BP (~2.2 mm Hg) (Rossi et al. 2013). The effects of resistance training do appear to be more robust in prehypertension patients (~4.3–4.7/~3.2–3.8 mm Hg) and following isometric resistance training (~10.9–11.8/~5.8–6.2 mm Hg) (Cornelissen et al. 2011; Cornelissen and Smart 2013). The effects of resistance exercise training on ambulatory BP remain largely unknown. In general, greater evidence is required to substantiate a larger role for resistance exercise in the management of BP (Eckell et al. 2013). The current level of evidence does suggest that resistance exercise can be performed safely without risk of increasing BP or adverse events (Hackam et al. 2013; Rossi et al. 2013).

Contraindications to exercise

It is recommended that all individuals complete appropriate screening prior to commencing an exercise program (Physical Activity Readiness Questionnaire (PAR-Q or PAR-Q+; available for download at www.csep.ca). A recent systematic review indicates exercise in patients with hypertension (~160/90 mm Hg) is relatively safe (Thomas et al. 2011). Those wishing to increase their physical activity level should consult the Electronic Physical Activity Readiness Medical Examination (ePARmed-X) or Physician Clearance Form and seek guidance from their clinician and (or) qualified exercise professional (Bredin et al. 2013; Canadian Society for Exercise Physiology 2014; Thomas et al. 2011; Warburton et al. 2011b). Exercise is generally contraindicated in untreated or uncontrolled hypertensive patients with resting BP >160–180/105–110 mm Hg (Pescatello et al. 2004), in addition to standard absolute and relative contraindications for aerobic and resistance exercise related to the presence of further comorbidities (Fletcher et al. 2001; Williams et al. 2007).

Conclusions

Lifestyle modifications, such as increased physical activity, remain underutilized strategies for controlling BP (Stanton and Lowenthal 2000). Considering that the incidence of adverse side effects (real or perceived) can be high with some antihypertensive drugs (Grégoire et al. 2001) and may ultimately contribute to low rates of drug compliance or adherence, lifestyle interventions should be given serious consideration as valuable modalities for patients to manage their BP and reduce their reliance on antihypertensive medications (Bredin et al. 2013). An important element of successful implementation of lifestyle modifications, including physical activity, often requires adoption of strategies to maintain behaviour adherence (Hackam et al. 2013).

The clinical impact of modest reductions in BP with exercise training should not be underestimated. A 5 mm Hg reduction in systolic BP is expected to translate into 14% and 9% reduction in stroke and coronary artery disease mortality, respectively (Chobanian et al. 2003). Furthermore, the beneficial effects of endurance and resistance exercise training on additional cardio-vascular disease risk factors (e.g., obesity, insulin resistance, dyslipidemia, depression (Fletcher et al. 2001)) can improve cumulative patient risk profiles.

In conclusion, a greater familiarity with current exercise guidelines and an emphasis on utilizing exercise as medicine will produce positive clinical benefits for patients with hypertension.

References
