



ORIGINAL ARTICLE

Long-term follow-up after aortic coarctation repair: The unsolved issue of exercise-induced hypertension



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Received 10 January 2013; accepted 4 February 2013

Available online 14 November 2013

KEYWORDS

Aortic coarctation;
Exercise-induced
hypertension;
Follow-up

Abstract

Introduction: Despite successful repair of aortic coarctation (AC), systemic hypertension (HTN) can persist in a significant percentage of patients. Exercise-induced HTN is also common in these patients, although its clinical significance is still unclear. In this study we aimed to assess the prevalence of exercise-induced HTN in adult patients with repaired AC.

Methods: We retrospectively reviewed the clinical records of patients aged >18 years with repaired AC followed at an adult congenital heart disease outpatient clinic in a tertiary care center. Demographic and clinical data including age at intervention, blood pressure (BP) at rest and on exercise, transthoracic echocardiogram (TTE) and treadmill exercise test results were evaluated. Exercise-induced HTN was defined as peak systolic BP ≥ 210 mmHg for men and ≥ 190 mmHg for women.

Results: We analyzed 65 patients (40 [61.5%] male; mean age at follow-up 30 ± 8 years). Median age at AC repair was 7 years (P25-P75: 4-20) and mean follow-up was 20 ± 7 years. Only one patient had diabetes and 10 (15.4%) had dyslipidemia. The majority of patients had controlled BP at rest and only nine (18%) were under antihypertensive medication. Forty-nine patients performed a treadmill exercise test. The mean duration of exercise was 10.7 ± 3.1 minutes and mean peak heart rate was 166 ± 18 beats per minute. Eleven (22%) patients had a hypertensive response, among whom only three (33%) had uncontrolled BP at rest. In our study treatment with angiotensin-converting enzyme inhibitors (ACEI) (OR 4.0 [95% CI 1.9–18.1]) and the peak instantaneous gradient in the descending aorta by TTE (OR 8.2 [95% CI 1.8–37.0]) were predictors of a hypertensive response with exercise. Age at surgery and type of AC repair were not associated with a hypertensive response on exercise.

Conclusions: In this study we found a significant prevalence of exercise-induced HTN in adult patients after successful AC repair despite adequate BP control at rest. Exercise-induced HTN was significantly related to higher peak gradient in the descending aorta and treatment with ACEI. These results highlight the complexity of the adult AC population and show that, even

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PALAVRAS-CHAVE

Coartação da aorta;
Hipertensão arterial,
Exercício;
Follow-up

after a good surgical result, several patients remain at high cardiovascular risk and require long-term follow-up.

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Follow-up a longo prazo de doentes com coartação da aorta corrigida: a eterna problemática da resposta hipertensiva ao exercício

Resumo

Introdução: Apesar de a correção bem-sucedida da coartação da aorta, a hipertensão arterial pode persistir numa percentagem significativa de doentes. A resposta hipertensiva ao esforço é também um achado comum nestes doentes, embora com significado clínico ainda pouco esclarecido. No presente estudo pretendemos avaliar a prevalência de hipertensão induzida pelo exercício numa população adulta com coartação da aorta corrigida.

Métodos: Análise retrospectiva de dados demográficos e clínicos de adultos operados a coartação da aorta, seguidos numa consulta de cardiopatias congénitas do adulto num centro terciário. Foram avaliados os dados correspondentes às características clínicas à data da cirurgia, perfil tensional atual, gradiente máximo residual na aorta descendente por ecocardiograma transtorácico (ETT) e parâmetros da prova de esforço. A resposta hipertensiva foi definida para uma pressão sistólica máxima no exercício ≥ 210 mmHg nos homens e ≥ 190 mmHg nas mulheres.

Resultados: Avaliamos 65 doentes [40 (61,5%) do sexo masculino; idade média 30 ± 8 anos]. A idade mediana à data da cirurgia foi 7 anos [percentil 25 - percentil 75 (P25-75)] (P25-75: 4-20 anos). O tempo médio de seguimento foi 20 ± 7 anos. Apenas um doente tinha diabetes *mellitus* e 10 (15,4%) tinham dislipidemia. A maioria dos doentes tinha a pressão arterial controlada em repouso e apenas 9 (18%) doentes ainda estavam sob titulação da terapêutica anti-hipertensiva. Quarenta e nove doentes foram submetidos a prova de esforço, sendo a duração média da prova de $10,7 \pm 3,1$ minutos e a frequência cardíaca máxima de 166 ± 18 batimentos por minuto. Onze (22%) doentes tiveram uma resposta hipertensiva com o exercício e apenas 3 (72,7%) destes mantinham difícil controlo da pressão arterial em repouso. A terapêutica concomitante com inibidores da enzima de conversão da angiotensina (i-ECA) [OR 4,0 (95% IC 1,9 - 18,1)] e um gradiente máximo na aorta descendente obtido por ETT [OR 8,2 (95% IC 1,8 - 37,0)] associaram-se a resposta hipertensiva ao esforço. A idade à data da cirurgia ou o tipo de cirurgia não se correlacionaram com a resposta hipertensiva ao exercício.

Conclusões: Neste estudo encontramos uma prevalência significativa de resposta hipertensiva ao exercício, após a correção bem-sucedida da CoAo, e apesar de um adequado controlo da pressão arterial em repouso. A resposta hipertensiva ao exercício esteve significativamente associada a um maior gradiente máximo na aorta descendente obtido por ETT, bem como ao uso de i-ECA como antihipertensores. Estes resultados realçam a complexidade da população adulta com CoAo e o facto de que muitos doentes permanecem sob importante risco cardiovascular, apesar de uma prévia correção da CoAo bem-sucedida.

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Introduction

Aortic coarctation (AC) was first described by Morgagni in 1760 and was characterized clinically in the early 20th century.^{1,2} It is a common malformation, found in 5–8% of children with congenital heart defects.^{3,4} It consists of a severe narrowing of the proximal descending aorta, creating a significant gradient in the descending aorta. If left untreated it is associated with poor prognosis and high mortality.⁵ Development of surgical techniques and more recently percutaneous aortic angioplasty with stent implantation has significantly improved the prognosis of these patients.^{6–8} However, AC cannot be considered a simple and easily corrected lesion. Even after successful repair, 20–40% of patients continue to have hypertension (HTN) at 10–20

years of follow-up and 20–35% have an abnormal blood pressure (BP) response to exercise despite being normotensive at rest.^{9–12} The pathophysiology of this abnormal BP behavior is unclear and different mechanisms have been proposed. Exercise-induced HTN has been attributed to abnormalities in aortic arch geometry, primary baroreceptor alterations and persistent structural and functional abnormalities of the vascular wall of the aorta and large arteries proximal to the former coarctation site.⁹ Moreover, life expectancy, although better than in untreated patients, is still less than in healthy subjects.¹³

There is ongoing controversy regarding the significance of abnormal exercise BP after AC repair.¹⁴ In this study we aimed to assess the prevalence of exercise-induced HTN in adult patients with repaired AC.

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