

Research Article

Aortic dilatation in children with systemic hypertension

Monesha Gupta-Malhotra, MBBS^{a,*}, Richard B. Devereux, MD^b, Archana Dave, DO^a, Cynthia Bell, MS^c, Ronald Portman, MD^c, and Diana Milewicz, MD, PhD^d

^aDivision of Pediatric Cardiology, Department of Pediatrics, Children's Memorial Hermann Hospital, The University of Texas Medical School at Houston, Houston, TX, USA;

^bDivision of Cardiology, Weill Cornell Medical College, New York, NY, USA;

^cDivision of Pediatric Nephrology, Department of Pediatrics, Children's Memorial Hermann Hospital, The University of Texas Medical School at Houston, Houston, TX, USA; and

^dDivision of Medical Genetics, Department of Internal Medicine, Memorial Hermann Hospital, The University of Texas Medical School at Houston, Houston, TX, USA

Manuscript received August 30, 2013 and accepted January 3, 2014

Abstract

The aim of the study was to determine the presence of aortic dilatation in hypertensive children, the prevalence of which is 4% to 10% in hypertensive adults. Prospectively enrolled multiethnic children, untreated for their hypertension, underwent an echocardiogram to exclude congenital heart disease and evaluate for end-organ damage and aortic size. The aorta was measured in the parasternal long-axis view at three levels: the sinus of Valsalva, supra-tubular junction, and the ascending aorta. Aortic dilatation was determined by z-score >2 at any one of the levels measured. Hypertension was defined as blood pressure above the 95th percentile based on the Fourth Working Group criteria confirmed by 24-hour ambulatory blood pressure monitoring. Among 142 consecutive hypertensive children (median age, 14 years; 45% females) aortic dilatation was detected in 2.8% (95% confidence interval, 1%–7%; median age, 16 years; 100% females). Children with aortic dilatation, when compared with those without, had significantly more aortic valve insufficiency ($P = .005$) and left ventricular hypertrophy ($P = .018$). Prevalence of aortic dilatation was 2.8% and was associated with significantly more aortic insufficiency and left ventricular hypertrophy in comparison to those without aortic dilatation. *J Am Soc Hypertens* 2014;8(4):239–245. © 2014 American Society of Hypertension. All rights reserved.

Keywords: Echocardiogram; essential hypertension; aortic insufficiency; left ventricular hypertrophy.

Introduction

Aortopathy, beginning with dilatation of the aorta and leading to aneurysm formation, is one of the serious complications of systemic hypertension and has been described in 4% to 10% of adults with hypertension.^{1–5} Aneurysms can occur anywhere in the aorta and are multifactorial in origin, but hemodynamic factors, especially systemic hypertension, may contribute to the progression of aortic aneurysmal dilatation and aortic valve regurgitation in the absence of aortic valve pathology. Hypertensive adults have been found to have higher aortic diameters in comparison to normotensive adults,⁶ and hypertension is a known risk factor for aortic dilatation in adults, particularly of the ascending aorta, and contributes to aortic dissection^{3,7,8} in adults.

In adults with untreated, uncomplicated, mild to moderate essential hypertension, the prevalence of dilatation at the

Author Disclosures: M. Gupta-Malhotra, None; R. Devereux, Consultation for Merck & Co and for Novartis, AG; A. Dave, None; C. Bell, None; R. Portman, Consultation for Boehringer Ingelheim and Bristol Myers Squibb Co; D. Milewicz, None.

Funding: The project described was partially supported by Grant Number K23HL089391 (PI Monesha Gupta MD) from the National Heart, Lung, and Blood Institute. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Heart, Lung, and Blood Institute or the National Institutes of Health.

*Corresponding author: Monesha Gupta-Malhotra, MBBS, FAAP, FACC, FASE, Division of Pediatric Cardiology, Children's Memorial Hermann Hospital, University of Texas, Houston Medical School, 6410 Fannin Street, UTPB Suite 425, Houston, TX 77030, USA. Tel: 713 500 5743; fax: 713 500 5751.

E-mail: Monesha.gupta@uth.tmc.edu

sinus of Valsalva has been reported at 3.7%.⁹ Furthermore, several independent predictors of sinus of Valsalva size in hypertensive adults have been found, including nocturnal diastolic blood pressure, anthropometric variables, male gender, left ventricular hypertrophy, and carotid atherosclerosis.⁹ Several of the cardiovascular end-organ damage manifestations seen in hypertensive adults have also been reported in hypertensive children, including left ventricular hypertrophy^{10,11} and increased carotid intimal thicknes.^{11,12} To our knowledge, aortic dilatation in the absence of aortic valve disease has not previously been described in children with hypertension. We postulated that dilatation of aorta in children, in comparison to adults, may have a lower contribution from aging and degenerative changes due to smoking, atherosclerosis, and so on, and have a higher degree of contribution from hypertension. The aim of the study was to determine the prevalence of aortic dilatation in children with untreated systemic hypertension.

Methods

Institutional Approval

The protocol was approved by the institutional Committee for the Protection of Human Subjects or the Institutional Review Board. All subjects and parents gave informed assent and consent, respectively, for this study. We were careful in maintaining full patient confidentiality, safeguarding the rights and welfare of human subjects, and informing subjects in a confidential manner of the results of the study.

Patient Population

This was a prospective study of subjects aged 1 to 19 years who were confirmed to have hypertension. Children with history of hypertension consisted of: (1) Referral Study Population: patients referred to the hypertension program after detection of elevated blood pressure by a primary care provider on several preceding occasions, and (2) Recruited Study Population: patients identified by systematic school-based screening for hypertension in students aged 11 to 18 years in Houston area public schools. Parents are notified in advance by letter sent from each school regarding the screening program. Forms were provided for parents to sign and return if they did not wish their child to participate. At each screening, three seated blood pressure measurements were made at least 1 minute apart using oscillometric monitors. Students found to have an average blood pressure above the gender, age, and height–percentile-specific 95th percentile blood pressure¹³ value underwent a second set of blood pressure measurements 1 to 2 weeks later. Students found to have blood pressure above the 95th percentile at the second screening underwent a third set of blood pressure measurements an additional 1 to 2 weeks later. Students with elevated blood pressure on all three occasions were considered to be hypertensive.

Families of hypertensive children are informed of the persistent blood pressure elevation and invited to participate in a clinic-based study of hypertensive end-organ injury in children. Patients recruited by these two methods (that is, school screening and referral, as described above), have been shown to be similar.¹⁴

Inclusion Criteria

Criteria for inclusion in further analysis were: (1) clinic blood pressure elevation above the 95th percentile on three previous occasions, and (2) no concurrent medication with the potential to raise blood pressure (eg, prednisone or methylphenidate).

All children were evaluated in the pediatric hypertension clinic for any secondary causes of hypertension; this was done by history, a physical examination, and further testing. Demographic and anthropometric data were collected on all subjects at study entry, including age, gender, height, weight, and ethnicity. Once hypertension was confirmed, all subjects underwent further evaluation for end-organ damage including a transthoracic echocardiogram prior to therapy. An echocardiogram was repeated approximately 1 year after initiating therapy.

Blood Pressure Protocol

All subjects underwent blood pressure evaluation in the pediatric hypertension clinic by a rigorous protocol. Blood pressure was measured as follows.

Clinic Blood Pressure

Clinic hypertensive status was confirmed in all subjects at the first visit to the hypertension clinic by averaging the last three of four blood pressure measurements performed by manual auscultation with a mercury sphygmomanometer by trained personnel using methodology recommended by the Fourth Working Group.¹³

Ambulatory Blood Pressure Monitoring

All subjects above 5 years of age underwent ambulatory blood pressure monitoring (ABPM) using Spacelabs oscillometric monitors (Spacelabs, Inc, Redmond, WA, USA). Blood pressure was measured every 20 minutes for 24 hours. Subjects with 24-hour systolic blood pressure or diastolic blood pressure greater than the pediatric 95th percentile or blood pressure load (% of blood pressure values exceeding the 95th percentile for the 24-hour period) greater than 25% were considered to have ambulatory hypertension. Subjects with clinic hypertension and 24-hours systolic blood pressure and diastolic blood pressure less than the pediatric 95th percentile and blood pressure load less than 25% were considered to have white coat hypertension and were excluded. Subjects with systolic or diastolic hypertension during the night on ABPM were considered to have nocturnal hypertension.

Download English Version:

<https://daneshyari.com/en/article/2957114>

Download Persian Version:

<https://daneshyari.com/article/2957114>

[Daneshyari.com](https://daneshyari.com)