



REVIEW ARTICLE

Importance of ambulatory blood pressure monitoring in the diagnosis and prognosis of pediatric hypertension ☆



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KEYWORDS

Pediatric age;
High blood pressure;
Ambulatory blood pressure monitoring;
White coat hypertension;
Masked hypertension;
Target organ damage

Abstract The prevalence of high blood pressure (BP) at pediatric age has increased progressively, one of the causes of which is obesity. However, the dominant etiology in this age group is renal and/or cardiovascular pathology. Ambulatory blood pressure monitoring (ABPM) is the method of choice for the diagnosis of hypertension, especially in children at high cardiovascular risk. Its use is limited to children from five years of age. Choosing appropriate cuff size is key to obtaining correct blood pressure.

The main indication for ABPM is to confirm the diagnosis of hypertension. It also allows the diagnosis of white coat hypertension (which may represent an intermediate stage between the normotensive phase and hypertension), or masked hypertension, associated with progression to sustained hypertension and left ventricular hypertrophy (LVH). Children with isolated nocturnal hypertension should be considered as having masked hypertension.

BP load is defined as the percentage of valid measurements above the 95th percentile for age, gender, and height. Values above 25-30% are pathological and those above 50% are predictive of LVH. ABPM correlates with target organ damage, particularly LVH and renal damage. It is useful in the differentiation of secondary hypertension, since these children show higher BP load and less nocturnal dipping, and confirmation of response to therapy. Thus ABPM allows the diagnosis and classification of hypertension, provides cardiovascular prognostic information and identifies patients with intermediate phenotypes of hypertension.

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☆ Please cite this article as: Andrade H, Pires A, Noronha N, Amaral ME, Lopes L, Martins P, et al. Importância da monitorização ambulatória da pressão arterial no diagnóstico e prognóstico da hipertensão arterial em idade pediátrica. Rev Port Cardiol. 2018;37:783–789.

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PALAVRAS-CHAVE

Idade pediátrica;
Hipertensão arterial;
Monitorização
ambulatória de
pressão arterial;
Hipertensão da bata
branca;
Hipertensão
mascarada;
Lesão de órgão alvo

Importância da monitorização ambulatória da pressão arterial no diagnóstico e prognóstico da hipertensão arterial em idade pediátrica

Resumo Em idade pediátrica a prevalência da hipertensão arterial (HTA) tem aumentado progressivamente, sendo a obesidade uma das responsáveis. Apesar disso, a etiologia dominante nesta faixa etária é a patologia renal e/ou a cardiovascular. A monitorização ambulatória de pressão arterial (MAPA) é o método de eleição para o diagnóstico de HTA, especialmente em crianças com risco cardiovascular elevado. O seu uso está limitado a crianças a partir dos cinco anos. A seleção do tamanho da braçadeira é o ponto chave na obtenção de leituras corretas da tensão arterial (TA).

O MAPA tem como principal indicação a confirmação do diagnóstico de HTA. Também permite diagnosticar hipertensão da bata branca (que pode representar um estágio intermédio entre a fase normotensa e a hipertensão), ou hipertensão mascarada, associada a progressão para hipertensão mantida e HVE. As crianças com HTA noturna isolada devem ser consideradas como portadoras de hipertensão mascarada. A carga tensional é definida como a percentagem de medições válidas acima do p95 para a idade, sexo e estatura, sendo que valores superiores a 25-30% são patológicos e superiores a 50% são preditivos de hipertrofia ventricular esquerda (HVE). O MAPA correlaciona-se com lesão de órgão alvo, nomeadamente com a HVE e a lesão renal. É útil na diferenciação da hipertensão secundária, já que estas crianças manifestam maiores cargas tensionais e menor *dipping* nocturno, e na confirmação da resposta à terapêutica.

Assim, o MAPA permite o diagnóstico e a classificação da HTA, fornece informação prognóstica cardiovascular e identifica doentes com fenótipos intermédios de HTA.

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Introduction

One in four adults worldwide is hypertensive. The prevalence of hypertension at pediatric age is increasing,¹⁻⁴ particularly in developed countries,⁵ with recent data showing prevalences around 4% and that of prehypertension reaching 10%.² In Portugal, a study by Maldonado et al.⁶ analyzing 5381 children found that 12.8% were hypertensive.⁶

Increasing obesity has led to changes in blood pressure (BP) patterns, including elevated BP levels in children and adolescents.^{1,5} Sustained adiposity and hence higher BP in childhood will tend to increase the prevalence of hypertension and its complications in adulthood.^{3,7-9} Obesity is the cardiovascular risk factor with the strongest relationship with BP, and higher body mass index is associated with progression from prehypertension to hypertension.¹⁰ However, the dominant etiology of hypertension in this age-group is renal and/or cardiovascular pathology.⁷

Definition of hypertension

The definition of hypertension in children has undergone significant changes in recent decades.⁸ The European Society of Hypertension (ESH) guidelines, published in 2016,⁴ classified resting BP values for children aged 0-15 years (Table 1) based on percentiles, while for those aged 16 or older the consensus was that the definitions used should be based on the absolute cut-offs used for adults.

Hypertension in children is generally defined as systolic blood pressure (SBP) and/or diastolic blood pressure (DBP) at or above the 95th percentile on three or more separate occasions.^{2-4,11}

The ESH guidelines⁴ also stress the importance of isolated systolic hypertension (ISH), the clinical significance of which in youth is still debated. ISH is the most prevalent form of elevated BP in adults aged over 50 years and its causes are multifactorial.

Neonatal hypertension has been defined as SBP at or above the 95th percentile for gender, gestational age and postnatal age. Its incidence is low (0.2-3%) and a history of umbilical catheterization is an important risk factor.¹² The importance of intrauterine and early life events in the development of cardiometabolic disease in adult life has been underlined.⁴ The time immediately before and after birth is a sensitive period in which multiple interactions between hemodynamic and metabolic parameters may contribute to risk of cardiometabolic disease.⁴ Target organ damage (TOD) has been reported in persistent neonatal hypertension.¹³

Birth weight affects ambulatory BP, with various studies showing an inverse relationship with daytime SBP.^{1,2} Premature infants born with intrauterine growth restriction have higher nocturnal BP in childhood and adolescence.^{2,10} BP monitoring is advisable from an early age in such high-risk cases,¹³ while regular BP measurement is recommended for all children from the age of three years.

Methods of blood pressure measurement in children**Office measurement, home readings or ambulatory monitoring?**

Office BP measurement is the first step in identifying children with suspected hypertension.² However, BP values are

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