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Commentary

Arterial Stiffness in Children and Adolescents with Persistent High Blood Pressure

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DESCRIPTION

An accepted proxy for the preclinical target organ damage caused by high blood pressure is arterial stiffness. This study examined the regional (aortic) and local (carotid) vascular stiffness in children and adolescents and its connection with blood pressure levels. The elastic qualities, or compliance, of the artery system play a significant role in how well conduit arteries can distend and store blood that can be perfused to tissues and organs during diastole and tolerate high pressure ejections from the heart during systole. Greater power is needed to expand and accommodate blood flow in stiffer arteries, which increases the workload on the heart and over time may result in left ventricular hypertrophy. This stiffening results from modifications to the cellular and structural elements of the vessel wall and is mediated by a number of intricate, interacting mechanisms, including the control of extrinsic factors and hemodynamic stresses. Collagen, elastin, metalloproteinase, and other hemodynamic and intraluminal forces interact intricately to cause vascular stiffening. A number of illness conditions, including hypertension, Chronic Kidney Disease (CKD), obesity, and diabetes, have been demonstrated to increase arterial stiffness. Arterial stiffening is a normal result of ageing. For instance, there are several variables that contribute to arterial stiffness in people with CKD, including arterial calcifications, systemic inflammation, malnutrition, vitamin deficiency, endothelial dysfunction, and bone activity. Aortic stiffness is also influenced by the balance of calcium and phosphate.

When compared to peripheral arterial segments, central measures of arterial stiffness have a stronger correlation with cardiovascular disease. They also have a higher predictive value for cardiovascular events than clinical risk factors, pulse pressure, and signs of atherosclerosis. Aortic Pulse Wave Velocity (PWV) in particular is a reliable indicator of cardiovascular events and overall mortality. The inclusion of PWV in the most current European hypertension recommendations, which include PWV as an optional measure in the management of hypertension, further demonstrates PWV's potency in predicting cardiovascular events and death. In addition to regional stiffness, the stiffness index, a local measure of central arterial stiffness, allows a direct evaluation of the stiffness of the aorta or carotid walls, is less reliant on blood pressure, and is preferred to systemic arterial stiffness. Children with obesity may have a higher risk of developing cardiovascular morbidity and death since the degree of central arterial stiffness in these kids is unknown. The goal of this study was to conduct a comprehensive review of the literature on the relationships between childhood and teenage obesity and arterial stiffness, as determined by central PWV and stiffness.

The importance of aortic PWV in determining cardiovascular risk in CKD and ESRD populations is becoming better acknowledged. In general populations as well as in persons with ESRD, aortic stiffness shows independent prognostic values for all-cause and cardiovascular mortality. According to a number of studies, vascular stiffness is a predictor of the advancement of renal disease and has a connection to lower glomerular filtration rate. The gold standard for measuring aortic stiffness in clinical and epidemiological investigations is carotid-femoral PWV, which is a direct indicator of aortic stiffness. In CKD patients, PWV has shown to be a valuable technique for monitoring and assessing arterial stiffness. It is important to target high-risk populations for intervention strategies to reduce the morbidity of cardiovascular disease in early CKD. This can be done by demonstrating PWV abnormalities and incorporating them into risk estimates for children to develop ESRD or, in longer-term follow-up, the risk of death or cardiovascular events.

While application tonometry's measurement of cfPWV is the most widely used indicator of arterial stiffness, it has certain drawbacks. It might be challenging to use applanation tonometry to acquire a pulse in some patients, especially in younger children. It is crucial that the heart rates do not considerably vary throughout the acquisition phases when monitoring the pulse wave at two distinct locations (the carotid and femoral). Because of this, it's crucial to make sure the patient is still throughout the measurement and has had enough time to

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recover. It might be more challenging to even when the patient is agreeable, maintain a strong signal from the smaller arteries in younger children. Similar to how fat can obscure the location of the pulse, particularly the femoral artery, it necessitates that the operator apply more pressure. Some individuals could feel embarrassed or uneasy about having their femoral artery exposed, which might cause the pulse rate to spike unnaturally. It is important to take care while explaining the procedure's significance and rationale before covering the patient with a blanket.