"Functional Changes that Accompany Hypertension"

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ABSTRACT

Hypertension is a multifactorial and multisystem condition, often without specific signs, that significantly impacts global health as a leading cause of morbidity and premature death. Defined by major guidelines as a systolic blood pressure >130 mmHg or diastolic pressure >80 mmHg, hypertension is highly prevalent, affecting approximately 30% of adults globally. Age-related incidence varies, with younger individuals showing higher prevalence in males, while this trend reverses post-65.

This condition stems from complex interplays among genetics, environmental factors, and physiological changes. Despite vast research, in 95% of cases, no direct cause is identified (primary hypertension). High blood pressure poses risks for heart failure, ischemic heart disease, kidney disease, stroke, and dementia, with elevated blood pressure linked to vascular dysfunction, renal issues, and immune responses that promote inflammation and target-organ damage. The condition is also characterized by oxidative stress, where excess oxidants lead to cellular damage and impact vascular health.

This chapter reviews the current understanding of hypertension, with a focus on molecular mechanisms and innovative diagnostic and management approaches relevant to healthcare providers.

INTRODUCTION

Hypertension involves elevated cardiac output or total peripheral resistance (TPR), with young adults often showing an increase in cardiac output initially, later shifting to increased TPR. Elevated TPR over time, often observed in clinical settings, leads to vasoconstriction and vascular remodeling, resulting in persistent hypertension.

With aging, arterial changes including elasticity loss contribute to increased systolic pressure, commonly seen in older populations as isolated systolic hypertension. In younger individuals, systolic hypertension is more closely linked to elevated heart contractility.

METHODOLOGY

Understanding hypertension requires insight into the interrelated physiological mechanisms regulating blood pressure (BP). These include renal salt balance, the renin-angiotensin-aldosterone system (RAAS), and pressure natriuresis mechanisms. Each plays a role in maintaining fluid balance and BP.

In normal physiology, increased salt intake slightly raises extracellular fluid, affecting BP only marginally. However, salt sensitivity, particularly prevalent in chronic kidney disease patients, the elderly, and certain genetic groups, can exacerbate hypertension. This section discusses salt sensitivity, RAAS interactions, and how pressure natriuresis responses modulate BP, particularly in pathological states.

RESULTS AND DISCUSSION

The study findings indicate hypertension's complex pathophysiology, involving renal dysfunction, the sympathetic nervous system, and oxidative stress. Salt sensitivity significantly influences BP regulation, with RAAS playing a pivotal role in long-term BP control. Excessive sympathetic activity and altered baroreflexes further contribute to hypertension's persistence.

Comparing this study's results with existing literature highlights potential therapeutic targets in RAAS and antioxidant pathways, offering new strategies for treating chronic hypertension effectively.

CONCLUSION

Hypertension's impact spans cardiovascular, renal, and nervous systems, influenced by genetic, environmental, and physiological factors. Comprehensive management approaches addressing underlying mechanisms like oxidative stress and RAAS dysregulation may improve therapeutic outcomes and reduce hypertension complications.

REFERENCES

1. Di Bona, G. F. (2002). Sympathetic nervous system and the kidney in hypertension. Current Opinion in Nephrology and Hypertension, 11(197-200).
2. Guyton, A. C., Hall, J. E., Coleman, T. G., Manning, R. D. (1990). The dominant role of the kidneys in the long-term regulation of arterial pressure in normal and hypertensive states. In J. H. Laragh & B. M. Brenner (Eds.), Hypertension: Pathophysiology Diagnosis and Management (pp. 1029-1052). New York: Raven.
3. Navar, L. G. (2005). The role of the kidneys in hypertension. Journal of Clinical Hypertension, 7(549-549).
4. Wilcox, C. S. (2005). Oxidative stress and nitric oxide deficiency in the kidney: A critical link to hypertension? American Journal of Physiology - Regulatory, Integrative and Comparative Physiology, 289(R913-R935).