Harvard Medical School Department of Continuing Education and the Cardiovascular Division of the Department of Medicine, Brigham and Women's Hospital

Cardiology Rounds
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The Role of Salt in Hypertension: Its Effects are Far More than to Increase Arterial Pressure

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Over the millennia, salt has played a major role in human behavior, economy, and discourse. In more recent decades, salt excess has been shown to be associated with disease. More specifically, epidemiological studies have repeatedly demonstrated a strong relationship between daily salt intake and the prevalence of hypertension in many populations, least frequently (if at all) in nonacculturated societies and greatest in Westernized populations. The phenomenon of "salt sensitivity" has been defined as "salt-loading that increases arterial pressure," while patients with hypertension whose pressures do not increase with salt-loading are considered to be "salt-resistant." These definitions have been documented in experimental animals and specific breeds of rats have been genetically developed to be either salt-sensitive or -resistant. Other genetic strains (ie, the spontaneously hypertensive rat [SHR]) are also sensitive to salt excess since they experience increasing arterial pressure with salt-loading but, in addition, develop other pathophysiological findings that are consistent with effects found in the target organs of patients with essential hypertension. This issue of *Cardiology Rounds* describes the changes in the heart, coronary arterioles, aorta, and kidney of the SHR that are related to salt-loading and consistent with clinical reports in patients with essential hypertension who have cardiac, vascular, aortic, and renal complications. The common denominator of these alterations is the pathological demonstration of collagen deposition and fibrosis of the extracellular tissue and perivascular arterioles. Also demonstrated experimentally and clinically is the reversal of these changes with agents that specifically inhibit the renin-angiotensin-aldosterone (RAAS) system locally. These findings suggest that, in addition to the wisdom of restricting dietary sodium intake, there is value in therapeutic pharmacological interventions that suppress the RAAS locally and/or systemically.

Questions:

1. "Salt sensitivity" has been defined as the ability of salt-loading to increase blood pressure in patients with systemic arterial hypertension.

   True ❑ False ❑

2. All patients with essential hypertension are "salt sensitive."

   True ❑ False ❑

3. Prolonged intake of excessive salt-loaded diets may produce pathophysiological changes in the following organs in hypertensive disease.
   a. Heart
   b. Arterioles
   c. Kidneys
   d. Aorta
   e. All of the above

4. With prolonged salt-loading, which of the following functional derangements have been demonstrated experimentally, as well as clinically, in hypertension?
    a. Diastolic left ventricular dysfunction with preserved systolic function
    b. Hypercreatinemia
    c. Decreased aortic distensibilitiy
    d. Proteinuria
    e. All of the above

5. The major pathological derangements associated with prolonged ingestion of excessive salt include:
    a. Contracted, scarred kidneys
    b. Loss of elastic fibers in the aortic media
    c. Hyperplastic changes of the left ventricular myocytes
    d. Deposition of collagen in heart and kidney
    e. All of the above.

6. Although salt-loading should suppress the classical endocrine RAAS, the fibrotic response of the heart and kidney to salt-loading is currently postulated to be mediated by other local renin-angiotensin systems.

    True ❑ False ❑

7. Adverse structural alterations in the heart's major vessels and the kidneys may be produced by excess dietary salt without a marked reduction in arterial pressure.

    True ❑ False ❑

To receive AMA category 1 credit, you must correctly answer 60% of the test questions.

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