

## Androgens and the Physiology of Hypertension

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**Abstract:** The roles of sex hormones have been under the scope of study for so long by physiologists as well as clinicians. Their actions on the cardiovascular system are undeniable and evidence is growing. Many research investigated the connection between the levels and the protective mechanisms on CVS physiology. It is a popular belief among clinicians that estrogens are powerful protectors of cardiovascular events; but, the notion that testosterone is as well was a novel concept. Testosterone was associated for the longest time with the bad and negative effects on the CVS, such as, increasing the risk for cardiac hypertrophy.

**Keywords:** sex hormones, CVS, cardiac hypertrophy, Testosterone, estrogens.

### INTRODUCTION

#### **This review summarizes the role of sex hormones and their beneficial actions**

It has been noted that low levels of testosterone is associated with increased death due to cardiovascular events [1]. Testosterone low levels have been linked to the development of metabolic syndrome [2].

It is widely accepted among the scientific community that gender affects the normal physiology starting from heart rate and its regulation to the physiology of hypertension. Jens Tank and others have investigated the relation between baroreceptor reflex and gender [3].

The notion that sex hormones modify the incidence of cardiovascular health problems were because of the unique patterns of these hormones in women compared to men. It is clear –thanks to many clinical trials- the existence of a direct modulation of vascular function by sex hormones [4].

However, the exact mechanisms through which these protective effects are achieved are yet to be understood.

A study in 2010 demonstrated the vasodilatory effect of both testosterone and cholesterol on the vessels, specifically the aorta. They showed that testosterone relaxed the aortic ring by inhibiting the calcium channels LTCC [5]. The authors suggested that the activity of both cholesterol and testosterone on the vessels are the same.

Published in 2001, Samantha and colleagues, attested for these beneficial roles of testosterone in their study. They showed that the parenteral testosterone given to postmenopausal women improved the physiology of the endothelium by the induction of vasodilation; they, however, stated that the underlying mechanisms need further studying [6].

Many studies at the epidemiological level indicated that patients with cardiovascular diseases have low levels of testosterone [7–10]. To further give testimony to the protective actions of testosterone.

A Cohort study lasted for 5 years reported that participants with lower serum testosterone levels experienced higher prevalence of traditional cardiovascular risk factors, to name just hypertension, diabetes, dyslipidemia, obesity. An observation that acute myocardial infarction (AMI), death after AMI, major stroke and all clinical events were more frequent ( $p < 0.001$ ) in patients with testosterone levels  $< 300$  ng/dl. They concluded that an intervention with testosterone may reduce the risk of getting new cardiovascular events as well as the well-established positive effects on the cardiovascular system [11].

A paper published on 2011 did shed some light into the molecular steps of Tyrosine kinase Eph working in concert with testosterone to control the secretion of catecholamines and the absence of both Eph and testosterone was behind the increment of blood pressure [12].

It is worth noting that hypertension is considered to be the primary risk factor behind many cardiovascular complications including but not limited myocardial infarction and heart failure.

### CONCLUSION

The risk of getting hypertension itself increases with age as a universal fact. This increased risk is more observed in women after they enter the stage of menopause. This has been attributed the declining concentrations of their sex hormones which were cardio-protective. However, a question has been raised of whether men and women differ in their handling and regulation of respective blood pressures. If so, this understanding will for sure change the approach in physiological viewing and the treatment perspective for hypertensive patients

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