The Baro-Adrenal Axis

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Abstract

The adrenal gland is a player in the Ominous Octet of obesity, which lists eight endocrine contributors to the development of obesity. Baro-adrenal axis describes the bidirectional, multifaceted link between weight homoeostasis and adrenal function, in health and disease. This communication lists the various ways in which adrenal function influences, and is impacted by, obesity.

Keywords: Adrenal, Cushing's syndrome, obesity, overweight, person centred care, pheochromocytoma, stress

Introduction

The adrenal glands are a pair of two small glands, weighing 3 grams apiece, situated above the kidneys. Though small in size, they secrete a variety of protein, amine and steroid hormones which help in homoeostasis and survival.[1]

The adrenal finds mention as part of the Ominous Octet of obesity.[2] This Octet includes four major and four minor players in obesity pathogenesis, along with the thyroid, gonads and muscle. The major players, to complete the list, are the hypothalamus, islets of Langerhans, gastro-intestinal tract and adipose tissue.

Bidirectional Relationship

The concept of baro-adrenal axis, along with baro-thyroid and-gonadal axes, as well as others, is part of the umbrella of barocrinology. The concept of barocrinology studies the various interactions between endocrine function and weight homeostasis.[3]

The baro-adrenal axis is a term that we use to describe the bidirectional, multifaceted link between weight homoeostasis and adrenal function, in health and disease. Table lists the various ways in which obesity/overweight influence adrenal function, as well as the clinical manifestations of adrenal disease in terms of barophenotypic abnormalities.[4-10] These interactions involve both cortical and medullary function, and suggest ways of improving therapeutic outcomes in persons with adrenal disease.

Table: The Baro-Adrenal Axis.

Adrenal Disease and Weight
• Adrenal insufficiency is characterized by weight loss
• Adrenal insufficiency and early onset obesity may occur as a genetic syndrome
• Cushing's syndrome leads to obesity, with a distinctive barophenotype
• Cushing's syndrome is associated with metabolic syndrome
• High levels of adrenaline lead to leptin resistance and weight gain
• Obesity/overweight are common in pheochromocytoma
Obesity and Adrenal Disease
• Obesity is associated with increased aldosterone release
• Obesity is associated with high DHEA-S (dehydroepiandrosterone sulphate) levels and the resultant hyperandrogenic features
• Metabolic syndrome is a subclinical form of Cushing' syndrome
• Obesity is associated with stress, and with high catecholamine levels
• Adrenal incidentalomas are more common in obese persons
Therapeutic Implications
• Keep a high index of clinical suspicion for exogenous as well as endogenous Cushing's syndrome in persons with obesity
• Practice diligent steroid stewardship while treating persons with exogenous gluco-corticoids, to mitigate weight gain
• Be aware of false positive high values of adrenal hormones in persons with obesity
• Weight loss can assist in correction of hyperandrogenic symptoms
• Manage hypertension in obese persons with aldosterone lowering drugs
• Stress management techniques may assist in weight loss in obese persons. Autonomic hygiene is an important part of comprehensive weight loss management programmes.

Use of baro-adrenal axis as routine terminology helps in ensuring comprehensive understanding and evaluation of the etiopathogenesis of obesity, as well as in planning appropriate lifestyle and pharmacological therapy. It also reminds us to focus on optimizing weight as a means of improving adrenal, and endocrine, function. As the obesity epidemic continues to grow, we must focus attention on the modifiable endocrine influences of weight homoeostasis.

Summary

The various interactions listed in Table provide a simple checklist for the obesity care. This knowledge helps ensure that investigations and treatment of obesity, and its related comorbidities, are carried out in a rational manner.

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