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Orthostatic intolerance and autonomic dysfunction following bariatric surgery: A retrospective study and review of the literature

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ABSTRACT

The prevalence and costs of the obesity epidemic and obesity-related conditions, including diabetes mellitus, is consistently increasing worldwide. Bariatric medicine is attempting to address this with weight loss and exercise programmes, and with increasing frequency, various forms of bariatric surgery. There has been considerable success reported after bariatric surgery but not without. We describe 14 patients with orthostatic intolerance (OI) post bariatric surgery. We report on OI (postural dizziness, palpitations and fainting), the results of cardiovascular autonomic testing and the associated and/or causative findings as well as reviewing the literature to consider the possible mechanisms.

Comprehensive autonomic testing revealed that 35.7% (Buchwald et al., 2004) of these patients fulfilled the criteria for the Postural Tachycardia Syndrome (PoTS), 57.1% (Cremieux et al., 2008) had low levels of basal BP and 42.9% (Cammisotto & Bendayan, 2007) patients were presyncopal and 14.3% (Billakanty et al., 2008) experienced syncope. We propose that the incidence of OI post-bariatric surgery is higher than considered, that certain cohorts may be more susceptible to complications, and that further research is needed to identify the prevalence and, ideally anticipate occurrence. With the increasing prevalence of obesity and required clinical interventions, further understanding of the pathophysiological processes causing autonomic dysfunction after bariatric interventions will aid management, which may differ in those with an underlying disposition to autonomic involvement, such as diabetics, in whom such procedures are increasingly used.

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1. Introduction

Obesity is the fifth leading risk for death worldwide and is a predisposing factor for common related disorders, such as diabetes, hypertension, stroke, cancer and osteoarthritis (Wang et al., 2011). The healthcare footprint of these obesity related diseases indicate that the lifetime medical cost of treating an obese individual is 30% more than that of an individual of normal weight. It is estimated that obesity or obesity-related treatment accounts for up to 2.8% of a country's total healthcare expenditure (Withrow and Alter, 2011). (See Fig. 1.)

Obesity has reached epidemic proportions in many nations. In England, 61.3% of the adult population is overweight (Department of Health, UK, 2013a,b). The World Health Organisation (WHO) provides evidence that obesity worldwide has more than doubled since 1980 (WHO, Obesity, and Overweight, 2013), with the United States of America (USA) and the United Kingdom (UK), amongst countries with the largest number of current and projected overweight and obese individuals (OECD, Key Facts, 2010).

Bariatric medicine aims to treat obesity by utilising various approaches, such as specific weight loss or calorie controlled diets with or without exercise programmes, weight loss drugs (for example, Orlistat), and government drives, such as Britain's 'Change for Life'campaign and the '5 A Day Plan' (Department of Health, UK, 2013a,b). Many bariatric patients have tried non-surgical weight loss programmes prior to considering surgery often with unsatisfactory results. Research has shown that dietary therapy can be effective, but not for sustained weight loss (Buchwald et al., 2004; Khwaja and Bonanomi, 2010), as is also the case for pharmaceutical weight loss measures.

Bariatric surgery is considered to be one of the most effective methods to treat obesity, particularly morbid obesity. Its use in the treatment of type 2 diabetes has been proposed, as it may be more cost effective than other treatments (Keidar, 2011).There are a number of procedures that can be used to adapt the gastrointestinal tract to reduce its volume and/or absorptive capacity (Khwaja and Bonanomi, 2010). The procedure chosen for each surgery is patient specific with consideration of age, body-mass index (BMI), co-morbidities and previous medical history, amongst other aspects. The benefit of these procedures has been well-documented and include the reduction of diabetic drugs (Schauer et al., 2012) and even improvement of autonomic function (Maser et al., 2007). After bariatric surgery patients are more productive, take less sick-leave, and utilise fewer healthcare resources. The long-term savings of bariatric surgery are estimated to offset the initial costs of the procedure in 2 to 4 years (Cremieux et al., 2008). These outcomes are beneficial to the patients' quality of life (QoL) (Sjostrom et al., 2007), as well as to the health service.

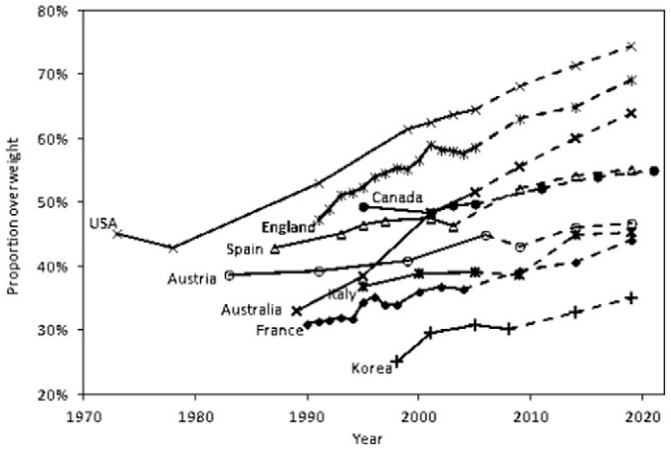

Fig. 1. Past and projected overweight rates.

Documented side-effects, generally surgical in nature, present fairly soon post-operatively and are treated rapidly (Khwaja and Bonanomi, 2010). As bariatric surgery gains popularity in the treatment of obesity, complications continue to emerge. Despite the increasing favour of this surgery , there have been relatively few studies that specifically report on autonomic dysfunction, including orthostatic intolerance (Billakanty et al., 2008; Rubinshtein et al., 2001; Loh and Ogunneye, 2013). We report on a series of such patients studied in our units who were referred because of orthostatic intolerance (OI) that may have had an autonomic aetiology.

1.1. Subjects and methods

1.1.1. Patients

We evaluated the records of 14 patients referred over a 5 year period for exclusion of an underlying autonomic condition causing or contributing to OI after bariatric surgery (see Table 1). These symptoms included dizziness, palpitations and fainting (syncope) when upright. Some had additional symptoms affecting other systems, including gastrointestinal (GI) disturbances such as abdominal bloating, abdominal pain and diarrhea.

There were 12 females and 2 males, aged 23–61 (mean age: 42 ± 9.9 years). At initial clinical evaluation, some patients had pre-existing medical conditions that could be associated with impairment of the autonomic nervous system such as diabetes (see Table 2). 57.1% (8) patients had features of joint hypermobility/laxity (JHS), 62.5% (5) of these with a confirmed diagnosis of Ehlers-Danlos III (EDS III) (see Table 2). There is a strong association, recently recognised, between JHS/EDS III and the postural tachycardia syndrome (PoTS) (Mathias et al., 2012).

CFS – chronic fatigue syndrome; PE – pulmonary embolism; PCOS – polycystic ovarian syndrome.

Autonomic investigations were conducted to assess cardiovascular function to exclude possible autonomic disease or dysfunction. All tests were performed using protocols established in our centres (Mathias et al., 2013).

- Autonomic Function Screening Testing, included head up tilt to 60° and cardiovascular autonomic responses to pressor (e.g. isometric exercise, cutaneous cold & mental arithmetic) and respiratory stimuli (e.g. respiratory sinus arrhythmia, Valsalva manoeuvre & hyperventilation) designed to assess the sympathetic and parasympathetic function.
- Blood for plasma catecholamines (noradrenaline, adrenaline and dopamine) levels were taken while supine and after 10 min of tilt or after 5 min of standing.
- Prolonged head up tilting was performed if needed.
- Food challenge (liquid meal challenge) (Mathias et al., 2013) was used to identify abnormal BP and/or HR changes in response to ingestion of food; and to HUT pre and 45 min post ingestion of food. Orthostatic BP and HR responses were assessed using a liquid meal challenge test with a 10-min head-up tilt test (HUT) at 60° before and after the liquid meal. All participants rested for 15 min before undergoing a HUT challenge for up to 10 min. After returning to the supine position, participants rested for 15 min before a standard