Impaired Iron Status in Severely Obese Bariatric Surgery Candidates is Multifactorial

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Introduction

It is established that obese individuals have poorer iron status compared to their normal weight counterparts; the cause of which is unknown. Potential theories have implicated inflammation, poor nutrition, increased physiological iron requirements, deprivation, and increased incidence of other pathology that may cause iron depletion.

Aims:

• To determine the prevalence of iron deficiency and anaemia in a severely obese cohort of bariatric surgery candidates
• To explore underlying associations with markers of nutrition and inflammation

Methods

In a retrospective review of 703 consecutive patients presenting for bariatric surgery assessment, 656 were evaluated after exclusions for haemoglobinopathy and missing data.

Assessment included:
• Clinical history: comorbidities, current medications, multivitamin use, smoking, alcohol
• Basic anthropometry: weight and height used to calculate indirect measures of adiposity.
• Body mass index (BMI)
• Blood tests: haemoglobin (Hb), serum iron, total iron binding capacity, iron binding saturation, ferritin, vitamin B12, vitamin B12, folate, white cell count (WCC), and C reactive protein (CRP)

Definitions:
• Anaemia: men: Hb<13g/dl, or women: Hb<12g/dl
• Iron deficiency: an abnormality in two or more measures of iron status

Results

Anaemia and iron deficiency were present in 9.9% and 11.4% of patients, respectively. Anaemia was more common in females than males (11.6 vs 8%), an expected observation; however the rate of anaemia in this population of men was much higher than that seen in the general population (1.3%) estimated from the National Diet and Nutrition Survey.1

Iron status of candidates was associated with BMI, as seen in Figure One.

Serum iron concentration is also associated with markers of inflammation. Dividing the cohort into quartiles of white cell count data shows that those that had the higher rates of inflammation had lower mean serum iron concentration (ANOVA, p=0.001), Figure Three.

Stepwise regression was performed with independent predictors of serum iron concentration – age, gender, BMI, BF%, index of multiple deprivation, diabetes status, number of comorbidities, WCC, CRP, folate, vitamin B12, and use of multivitamins, metformin, insulin, non-steroidal anti-inflammatory drugs (NSAIDs) or proton pump inhibitors.

This revealed a highly significant association between serum iron concentration and CRP (R²=0.227, p<0.001). Of 656 patients analysed, unfortunately only 24% (n=156) had CRP measurements. Thus, this may not reflect the relationship among the whole cohort.

Excluding CRP from the regression analysis revealed that WCC had the largest independent effect on serum iron concentration. In this model, NSAIDs, gender and diabetes status also contributed (R²=0.076, p<0.001). Although this model exhibited a significant association, it was much weaker than that found between serum iron and CRP.

Conclusions

Anaemia and iron deficiency are relatively common in severely obese individuals. This investigation has shown that the relationship between obesity and poor iron status is complicated by many factors. The strong associations observed between serum iron concentration and CRP suggests that inflammation has a significant role, however only 20% of the variation is explained from this variable, hence a multifactorial aetiology is likely.

References: