

Poster presentation

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Cardiovascular dysfunction and associated risk factors in extremely obese adolescents scheduled for bariatric surgery

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Introduction

Extreme obesity is a major risk factor for diabetes and several forms of heart disease in adults, but the corresponding impact on risks in children are less well defined.

Purpose

The aim of our study was to assess metabolic and cardiovascular (CV) risk factors in addition to cardiac structure and function as determined by cardiac magnetic resonance (CMR), in a cohort of morbidly obese adolescents scheduled for bariatric surgery.

Methods

We conducted a retrospective analysis of a series of extremely obese patients ($n = 10$; BMI = 37-76 kg/m²) undergoing pre-operative metabolic and cardiovascular assessments with CMR (using a standard protocol; 1.5 T; Siemens Espree). Measures of LV systolic and diastolic performance and pericardial fat were made. In addition, stress perfusion was used to assess myocardial perfusion reserve index (MPRI), determined by the upslope of myocardial signal enhancement during adenosine stress vs. rest. Post-analysis comparisons were compared to reference values derived from age matched lean controls and normalized for height and gender. Blood pressure and fasting blood samples were also studied for metabolic and inflammatory biomarkers.

Results

A majority of patients (7/10) had hypertension, evidence of LV hypertrophy (6/10 had 20 g above predicted LV mass), LV dilation (5/10 had >40 mL/cm above predicted) and epicardial fat (0.1-0.7 cm thickness). Furthermore, MPRI was 1.8 ± 0.48 (range 0.8-2.6, substantially lower than expected values >4.0), suggesting perfusion reserve limitations. In contrast, LVEF was normal ($61 \pm 4\%$) and there was no evident myocardial fibrosis or diastolic dysfunction. Blood analysis showed that 7/10 had C-reactive protein (CRP) >2.0 mg/L, and 8/10 had Homeostasis Model Assessment of insulin resistance (HOMA-IR) scores >1.5, demonstrating increased inflammation and insulin resistance, respectively. CRP correlated with epicardial fat thickness ($p < 0.05$); systolic blood pressure correlated to LV mass ($p < 0.02$) and diastolic blood pressure correlated with LV volume ($p < 0.05$).

Conclusion

These data demonstrate that extremely obese adolescents, despite absence of symptoms, have substantial burden of CV risks and demonstrable abnormalities in cardiac structure and function. Further studies to evaluate long term impact of these abnormalities into adulthood and recovery potential following bariatric surgery and related weight loss are warranted.