Obesity may influence heart function through sex hormones

April 29 2013

New research suggests that changes in sex hormones as seen in obesity may have possible effects on the heart. The study by researchers from Belgium, presented at the European Congress of Endocrinology in Copenhagen, Denmark, suggests effects on heart function in healthy men with artificially raised oestrogen levels and artificially lowered testosterone levels to mimic an obese state.

Oestradiol, an oestrogen, is primarily known as a female hormone but it also circulates at very low levels in men. Testosterone is converted to oestradiol by the enzyme aromatase, the activity of which might be increased in obesity leading to raised oestradiol and reduced testosterone.

To determine whether obesity might alter heart function via changes in sex hormones, Drs Maarten De Smet and colleagues at Ghent University in Belgium recruited 20 healthy men aged 20-40 and used an aromatase inhibitor and an oestrogen patch to artificially alter the hormone levels to mimic sex hormone concentrations in obesity (high estradiol and low testosterone) vs contrast by an aromatase inhibitor (low oestradiol, high testosterone). Prof Dr T De Backer, Cardiologist, assessed the heart function before and seven days after the intervention using ultrasonographic imaging with strain analysis, which measures the deformation of the heart between the resting and contracted states.

The men with obesity-related changes in sex hormones exhibited altered heart function. At baseline the global circumferential strain was -17.1%

+/-3.9, which decreased significantly to -14% +/-2.5 (p=0.01). The contrasting group did not show any difference.

By artificially altering sex hormones in a small number of healthy men, Drs De Smet and colleagues have shown that an altered sex hormone profile as seen in obesity might be relevant for heart function. Adequately powered clinical trials with sufficient duration may establish the role of sex hormones in the heart function of obese men.

Maarten De Smet, Masters student in Medicine at Ghent University, Belgium, and first author said:

"Obesity is a major contributor to heart disease. By giving an aromatase inhibitor and oestrogen to healthy men we mimicked the effect of sex hormones in obesity alone, in isolation from the rest of the obese metabolic state.

"In order to pump blood around the body the heart must fill with blood and then contract, pushing the blood out. We found that after increasing the oestrogen levels and decreasing the testosterone levels in men for one week the deformation of the left heart chamber was significantly altered.

"Because the contributing factors to obesity, as well as the underlying biology, are so complicated it's a real challenge to tease apart one single aspect, so we think this study is of particular interest. As these results are from a small number of healthy men over one week, we hope to investigate sex hormone changes and the heart in the obese in the long term."

More information: www.endocrine-abstracts.org/ea/0032/default.htm

Short-term Changes in Serum Sex Steroid Levels and Cardiac Function in Healthy Young Men, Maarten De Smet, Bruno Lapauw, Tine De

Backer, Johannes Ruige

Introduction: Male obesity is associated with an increase in estradiol (E2) and a decrease in testosterone (T). And, although sex steroids are associated with cardiovascular disease, direct effects on cardiac structure and function are hardly investigated in humans.
Methodology: 20 healthy men aged 20-40 years were randomized into 2 groups. One group was given an aromatase inhibitor (letrozole) only, thus obtaining a high T and low E2 (group T). The other group received an aromatase inhibitor plus an E2 patch (dermestril), reaching a low T and high E2 (group E). Serum levels of both T and E2 remained within the normal reference range. The men underwent an echocardiography by a single cardiologist before the start of the intervention and after 7 days.
Results: Total and free E2 serum levels were positively associated with ejection fraction (r=0.7, P=0.002 and r=0.6, P=0.007 respectively) at baseline in the whole group. In group E global circumferential strain decreased significantly from -25.3% ± 3.9 to -19.6% ± 2.5 after one week as compared to baseline (P=0.01). No significant changes in systolic function were observed in group T. Cardiac structure remained unaltered.
Conclusion: In young healthy men, an increase in E2 and decrease in T levels significantly decreased circumferential strain. The finding justifies larger studies of longer duration to discover the exact nature of the impact of changed sex steroids on cardiac function and remodelling in obesity.

Provided by European Congress of Endocrinology