

Theme: Applied physiology; PET and MR imaging

Striatal Dopaminergic Dysfunction in Obesity is Normalized after Bariatric Surgery: a Multimodal PET/fMRI Study

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Abstract:

Obesity has become an epidemic of global proportions, being one of the leading causes of morbidity and mortality. Bariatric surgery (BS) is the treatment of choice when other options have failed to treat obesity. However, not all patients lose weight, and weight regain is a common concern. It has been suggested that weight loss (WL) after BS is likely due to changes in central nervous hunger and satiety control rather than purely restrictive gastric volume or malabsorption. We hypothesize that central dopaminergic function in striatal reward-related brain regions is critical to successful BS outcomes. As such, we aim to investigate the role of dopamine type 2 and 3 receptors (D2/3R) in successful WL through BS. PET with [¹¹C]raclopride was used to map D2/3R in 48 women: 19 women with a successful response to BS (pBSsuccess), 12 women with obesity (OB) and 17 normal-weight women (NW). To further address our aim, we investigated how neural responses to food content measured by fMRI and other key variables correlate with dopaminergic function. PET results found region of interest (ROI)-level significant differences between OB and NW in the ventral striatum. Cluster-level analysis, add to the ROI-level results, differences over the whole striatum between pBSsuccess and OB groups, with the BS group reaching a pattern similar to NW. These results suggest that WL after BS may underlie a sort of “normalization” in central nervous hunger and satiety control through the dopaminergic system. This pattern is corroborated by the association between altered higher D2/3R binding values and dysfunctional measures of eating behaviours, fMRI metrics of visual food cues, and high-calorie food preferences in obesity. Striatal dopaminergic dysfunction in obesity may attribute incentive salience to food-associated stimuli so that food cues elicit craving and trigger neural networks linked to compulsive behaviour control and reward-seeking processing.

Keywords: Bariatric Surgery; Central Dopamine Receptors; Obesity; Molecular Neuroimaging; Weight loss