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Oxytocin Therapy May Improve Eating Behaviors in Children with Single-Minded-1 Gene Mutation

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Single-minded-1 gene *(SIM1*) is associated with the regulation of energy homeostasis in humans, and loss-of-function of this gene leads to non-syndromic early-onset severe obesity in children. To the best of our knowledge, there is no known evidence-based treatment for SIM-1 patients. It has been hypothesized that these patients may benefit from oxytocin treatment.

Oxytocin hormone acts on hypothalamus, basal ganglia, ventral tegmental area, and insula involved in reward, impulse control, addiction, and behavior for regulating energy intake and expenditure.[1] Oxytocin hormone may also exert many beneficial effects on glucose metabolism, fatty acid oxidation, and reducing insulin sensitivity.[1] Patients with SIM-1 manifested with hyperphagia, behavioral problems, speech and language delay, and dysmorphic features like Prader-Willi syndrome (PWS).[2,3] Miller et al[4] showed that oxytocin therapy improved appetite drive and disruptive and repetitive behaviors in children with PWS. Patients with SIM-1 had low expression of oxytocin, thyrotropin-releasing hormone, corticotropin-releasing hormone, vasopressin, and somatostatin.[2,3] These patients tend to regulate food and satiety responsiveness with low oxytocin levels. Single-minded-1 gene haploinsufficiency is associated with altered hypothalamic paraventricular nucleus neuropeptide expression mediating with increased appetite and linear growth in humans and mice.[5,6] These studies suggested oxytocin neuropeptide is the most important mechanism for the hyperphagic obesity of SIM 1+/– in humans and mice. If oxytocin treatment may be administered to these patients, they might regulate energy intake and expenditure pathway by acting on central nervous system.

Patients with craniopharyngioma usually presented with eating behavior problems due to hypothalamic damage resulting from neurosurgery and radiotherapy, suggesting that these patients produced reduced level of oxytocin hormone and could not regulate their appetite and satiety.[7] Hsu et al[7] reported that oxytocin treatment improved eating behaviors and habits and reduced body mass index in patients with craniopharyngioma.

Patients with SIM-1 may suffer from lack of oxytocin hormone because of low hypothalamic expression. These patients may benefit from oxytocin treatment for providing energy intake and expenditure balance. It has been believed that oxytocin therapy can improve decreased satiety, increased hunger, energy expenditure, and lipolysis, so the risk of obesity comorbidities such as cardiovascular, diabetes, hypertension, obstructive sleep apnea, and cancer will reduce. Further studies are required in order to disclose oxytocin therapy on appetite of patients with SIM-1.

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