THE ROLE OF GLP-1 RECEPTOR AGONISTS IN THE TREATMENT OF DIABETES MELLITUS AND OBESITY

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Abstract: Obesity and type 2 diabetes mellitus (T2DM) are among the most prevalent chronic diseases worldwide and represent major public health challenges. The growing prevalence of these conditions has increased the demand for effective therapeutic strategies that address both glycemic control and excess body weight. Glucagon-like peptide-1 (GLP-1) receptor agonists have emerged as a promising class of medications due to their ability to improve glucose metabolism, reduce appetite, and promote weight loss. This article reviews the physiological mechanisms, clinical effectiveness, therapeutic benefits, and adverse effects of GLP-1 receptor agonists in the management of diabetes mellitus and obesity. Current evidence indicates that agents such as liraglutide, semaglutide, and tirzepatide significantly improve glycemic parameters, decrease body weight, and reduce cardiovascular risk. These findings support the increasing role of GLP-1 receptor agonists as an important component of modern metabolic disease management.

Keywords: GLP-1 receptor agonists, obesity, type 2 diabetes mellitus, semaglutide, liraglutide, tirzepatide, glycemic control, weight loss.

Introduction

The prevalence of obesity and type 2 diabetes mellitus has increased dramatically over recent decades, becoming a major burden on healthcare systems worldwide. According to international epidemiological data, obesity is strongly associated with insulin resistance, dyslipidemia, hypertension, and cardiovascular diseases. Excess body weight significantly increases the risk of developing T2DM and contributes to the progression of metabolic complications.

Traditional treatment approaches for diabetes have primarily focused on lowering blood glucose levels. However, many conventional antidiabetic drugs have limited effects on body weight or may even promote weight gain. Consequently, there has been growing interest in therapeutic agents capable of addressing both hyperglycemia and obesity simultaneously.

Glucagon-like peptide-1 is an incretin hormone secreted by intestinal L-cells in response to food intake. It enhances glucose-dependent insulin secretion, suppresses glucagon release, delays gastric emptying, and increases satiety. Because of these physiological actions, GLP-1 receptor agonists have become an effective therapeutic option for patients with T2DM and obesity.

The purpose of this study is to evaluate the role of GLP-1 receptor agonists in the treatment of diabetes mellitus and obesity by reviewing current scientific evidence regarding their mechanisms of action, clinical efficacy, and safety profile.

Materials and Methods

This study was conducted as a literature review based on recent scientific publications, clinical guidelines, and international recommendations related to GLP-1 receptor agonists. Relevant articles were

identified through academic databases, including PubMed, Google Scholar, and international diabetes associations.

The analysis focused on the pharmacological characteristics and clinical outcomes of commonly used GLP-1 receptor agonists, including liraglutide, semaglutide, dulaglutide, and tirzepatide. Data regarding glycemic control, weight reduction, cardiovascular outcomes, and adverse effects were reviewed and compared.

Results

GLP-1 receptor agonists exert multiple beneficial effects through their interaction with GLP-1 receptors located in the pancreas, gastrointestinal tract, central nervous system, and cardiovascular tissues.

One of the primary mechanisms involves stimulation of glucose-dependent insulin secretion from pancreatic beta cells. Simultaneously, these agents suppress glucagon secretion from alpha cells, reducing hepatic glucose production and improving glycemic regulation.

Another important effect is delayed gastric emptying, which slows nutrient absorption and prolongs feelings of fullness after meals. As a result, patients experience reduced caloric intake and gradual weight loss. In addition, GLP-1 receptor agonists act on appetite-regulating centers in the hypothalamus, further decreasing hunger and food consumption.

Clinical studies have demonstrated significant reductions in glycated hemoglobin (HbA1c) levels among patients receiving GLP-1 receptor agonist therapy. Semaglutide has been associated with HbA1c reductions exceeding 1.5% in many patients, while also producing substantial weight loss.

Table 1. Major Clinical Effects of GLP-1 Receptor Agonists

Clinical Parameter	Effect
Blood glucose levels	Decrease
HbA1c	Significant reduction
Body weight	Reduction
Appetite	Suppression
Gastric emptying	Delayed
Cardiovascular risk	Reduced
Insulin secretion	Increased
Glucagon secretion	Decreased

Several large-scale clinical trials have shown that semaglutide and tirzepatide can achieve body weight reductions of more than 10–15% in individuals with obesity. These medications have also demonstrated favorable effects on blood pressure, lipid profiles, and cardiovascular outcomes.

Discussion

The findings of this review highlight the growing importance of GLP-1 receptor agonists in the management of metabolic diseases. Unlike many traditional antidiabetic medications, these agents not only improve glycemic control but also promote clinically meaningful weight loss.

The effectiveness of GLP-1 receptor agonists is particularly relevant because obesity and T2DM frequently coexist and contribute to each other's progression. By targeting multiple physiological pathways simultaneously, these medications provide a comprehensive approach to disease management.

Semaglutide has attracted considerable attention due to its superior efficacy in both diabetes treatment and obesity management. Clinical trials have reported significant improvements in body weight, insulin sensitivity, and metabolic parameters. Similarly, tirzepatide, a dual GIP and GLP-1 receptor agonist, has demonstrated even greater weight reduction in some studies.

In addition to metabolic benefits, GLP-1 receptor agonists have shown cardiovascular protective effects. Reduced rates of major adverse cardiovascular events have been observed in high-risk patients receiving these therapies, making them particularly valuable for individuals with diabetes and established cardiovascular disease.

Despite their advantages, GLP-1 receptor agonists are associated with certain adverse effects. The most common include nausea, vomiting, diarrhea, abdominal discomfort, and transient gastrointestinal symptoms. These effects are generally mild to moderate and tend to decrease with continued treatment.

Another limitation is the relatively high cost of these medications, which may restrict access for some patients. Furthermore, discontinuation of therapy is often associated with partial weight regain, emphasizing the importance of long-term treatment strategies and lifestyle modifications.

Conclusion

GLP-1 receptor agonists represent a major advancement in the treatment of type 2 diabetes mellitus and obesity. Their ability to improve glycemic control, reduce body weight, suppress appetite, and lower cardiovascular risk distinguishes them from many conventional therapies.

Current evidence supports the use of liraglutide, semaglutide, and tirzepatide as effective therapeutic options for patients with metabolic disorders. Continued research is necessary to evaluate their long-term safety, optimize treatment protocols, and expand access to these innovative medications. As the prevalence of obesity and diabetes continues to rise globally, GLP-1 receptor agonists are expected to play an increasingly important role in modern clinical practice.

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