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Intermittent Fasting as A Method of Correcting Insulin Resistance in Type 2 Diabetes Mellitus

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Abstract

This article examines the mechanisms by which intermittent fasting influences tissue insulin sensitivity, pancreatic β- cell function, glucose levels, and glycated hemoglobin. Clinical trial data confirming the effectiveness of intermittent fasting in promoting weight loss and improving metabolic parameters in patients with type 2 diabetes are analyzed. Indications, contraindications, and the need for medical supervision when using intermittent fasting are discussed. The article highlights the potential of intermittent fasting as a complement to traditional therapy for type 2 diabetes.

Keywords: Type 2 diabetes mellitus, intermittent fasting, insulin resistance, glycemic control, β- cells, metabolic disorders, treatment, health.

Introduction

Scientific novelty. This article summarizes current data on the mechanisms by which intermittent fasting influences insulin resistance , β- cell function , and the metabolic profile in type 2 diabetes. A comparison of various intermittent fasting regimens (16/8, 5:2, and temporary food restriction) and their clinical efficacy is presented, allowing us to identify the most promising approaches for glycemic control and weight loss.

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease characterized by insulin resistance and pancreatic β- cell dysfunction. Key risk factors include obesity, low physical activity, dyslipidemia, and genetic predisposition [1].

Intermittent fasting (IF), a dietary regimen that alternates periods of complete or partial fasting with periods of eating, has attracted considerable attention as a potential method for correcting insulin resistance and improving the metabolic profile in type 2 diabetes . The most common IF regimens include time-restricted eating (e.g., 16/8, 16 hours of fasting and 8 hours of eating) and intermittent calorie restriction (e.g., 5:2, two days a week of acute calorie restriction) [2].

Scientific evidence confirms that intermittent fasting effectively impacts key markers of type 2 diabetes. Intermittent fasting results in significant weight loss. For example, studies have shown that intermittent fasting can reduce body weight by an average of 3.6%, a more significant result than traditional continuous calorie restriction [3]. Blood glucose and glycated hemoglobin (HbA1c) levels are reduced. Intermittent fasting can contribute to increased tissue sensitivity to

insulin. Systemic inflammation and oxidative stress are reduced, which are important pathogenetic factors in type 2 diabetes.

Despite encouraging results, the use of IG in patients with type 2 diabetes requires caution due to potential risks (risk of hypoglycemia). Individual contraindications and comorbidities must be considered.

The purpose of this article is to analyze current clinical data on the use of intermittent fasting in the treatment of type 2 diabetes, evaluate its effectiveness and safety, discuss possible mechanisms of action, and formulate clinical recommendations for practical use.

Intermittent fasting (IF), a regimen in which periods of eating are alternated with periods of fasting, is a promising approach for correcting insulin resistance and improving glycemic control in type 2 diabetes mellitus (T2DM) by targeting various metabolic pathways:

1. Improvement of insulin sensitivity and HOMA-IR. IG helps to reduce insulin resistance . Systematic reviews and meta-analyses confirm that IG leads to a decrease in fasting insulin and glucose levels and a decrease in the HOMA-IR index, which indicates an increase in systemic insulin sensitivity in patients with metabolic syndrome and type 2 diabetes [4].

2. Reduction of glycemia and glycated hemoglobin HbA1c. IF provides an effective reduction in parameters important for the control of T2DM. Temporary restriction of food intake (e.g., 16/8) improves β- cell function and insulin sensitivity in patients with early T2DM [5]. Randomized clinical trials, in particular the 5:2 approach (intermittent fasting), have shown a significant reduction in HbA1c (by 1.9%), which may be superior to the results of traditional treatments [6].

3. Effect on pancreatic β- cell function. Ig may have a beneficial effect on β- cell function, although this mechanism requires further study. In preclinical models of T2DM, Ig has been shown to protect β- cell identity and function, potentially contributing to improved long-term glycemic control [7]. However, it is important to note that excessively long-term or aggressive Ig in other models may, conversely, impair β- cell function, highlighting the need for a balanced and controlled approach [8].

4. Weight loss and lipid profile improvement. IG is an effective tool for improving overall metabolic parameters associated with T2DM. IG promotes reduction in total body weight and waist circumference. Significant improvement in lipid profile, including reduction in total cholesterol, low-density lipoprotein (LDL), and triglyceride levels, is observed in patients with metabolic disorders [9].

5. Anti-inflammatory and antioxidant effects. IG has a beneficial indirect effect on metabolic status. Adherence to IG leads to a reduction in systemic inflammation and oxidative stress. This anti-inflammatory and antioxidant effect may play an important role in improving glycemic control, protecting β- cells, and reducing the risk of microvascular complications in T2DM [10].

Table 1 - Effect of intermittent fasting on metabolic parameters in type 2 diabetes mellitus

Parameter	**The IG effect**
Fasting glucose level	Decrease
HbA1c level	Decrease
Insulin sensitivity	Improvement
Body weight	Decrease
Blood lipid levels	Decrease
Function of β- cells	Improvement
Inflammation and oxidative stress	Decrease

Thus, intermittent fasting has a complex effect on various metabolic processes, making it a promising method for correcting insulin resistance and improving glycemic control in type 2 diabetes.

Clinical studies and meta-analyses confirm that intermittent fasting (IF) is a highly effective method for correcting insulin resistance and significantly improving glycemic control in patients with type 2 diabetes mellitus (T2DM). IF demonstrates positive results in reducing HbA1c, body weight, and improving metabolic parameters.

Key clinical evidence for the effectiveness of IG:

1. 5:2 Meal Replacement Regimen (5:2 MR) vs. Pharmacotherapy. A randomized trial published in JAMA Network Open compared the 5:2 MR regimen (two days of restricted feeding, five days of normal feeding) with metformin and empagliflozin in 405 patients with early type 2 diabetes . After 16 weeks, the 5:2 MR group showed the greatest reduction in HbA1c (by 1.9%), significantly outperforming metformin (by 0.3%) and empagliflozin (by 0.4%). Weight loss in the 5:2 MR group was also the greatest (9.7 kg), exceeding metformin (5.5 kg) and empagliflozin (5.8 kg) [6].

2. IG in combination with calorie restriction. Studies have shown that IG in combination with total calorie restriction leads to significant reductions in HbA1c, fasting glucose, HOMA-IR, and body weight, as well as improvements in the lipid profile in patients with insulin resistance and type 2 diabetes.

3. Comparison of diet types. A study presented at the Endocrine Society annual meeting (ENDO 2025) compared IF, temporary dietary restriction, and chronic calorie restriction in patients with obesity and type 2 diabetes. Although all approaches improved glucose levels and reduced body weight, IF and temporary dietary restriction demonstrated more significant positive results [11].

Intermittent fasting is an effective and powerful method for improving glycemic control and correcting insulin resistance in type 2 diabetes, often comparable to or superior to traditional pharmacological and dietary approaches in the short term. Intermittent fasting can be considered as an alternative or complementary approach to standard treatment, including pharmacotherapy and continuous calorie restriction. However, given the potential risk of hypoglycemia, especially for patients taking antidiabetic medications, prior to initiating intermittent fasting, a consultation with a physician is necessary for an individualized assessment of the indications, contraindications, and adjustment of the treatment regimen.

Intermittent fasting (IF) has been shown to have positive effects on insulin resistance, glycemic control, and metabolic profile in patients with type 2 diabetes mellitus (T2DM). However, its use requires careful attention to safety and contraindications, as it may increase the risk of hypoglycemia and other complications in certain patient groups.

Main risks and potential complications:

1. Hypoglycemia. The main risk is in patients taking hypoglycemic medications, especially insulin and secretagogues (e.g., sulfonylureas). Symptoms include weakness, tremors, dizziness, sweating, and decreased concentration. Blood glucose monitoring is necessary during fasting.

2. Dehydration and electrolyte imbalance. Restriction of food intake may be accompanied by a decrease in fluid and electrolytes. Adequate water intake and electrolyte monitoring are recommended in patients with chronic kidney disease.

3. Psychological stress and eating disorders. Some patients may experience overeating during mealtimes, which reduces the effectiveness of IG. Emotional disturbances, irritability, and decreased concentration are possible.
4. Contraindications for concomitant diseases: liver and kidney diseases, pregnancy and lactation, history of eating disorders, old age with multiple concomitant diseases.
Recommendations for safe use:
- performing IG only under the supervision of a physician, especially in patients with type 2 diabetes who are taking insulin or other hypoglycemic drugs;
- gradual introduction of a fasting regimen (for example, initially 12–14 hours, then increasing to 16 hours).
- regular monitoring of glycemia and body weight.
If symptoms of hypoglycemia appear: stop fasting and adjust therapy.

Table 2 - Safety and contraindications of intermittent fasting for type 2 diabetes

Category	Potential risk/contraindication	Safety recommendations
Patients on insulin/ secretagogues	Hypoglycemia	Glucose monitoring, drug dosage adjustments
Liver and kidney diseases	Exacerbation of chronic diseases	Doctor's consultation, laboratory monitoring
Elderly patients	Dehydration, loss of muscle mass	Weight control, adequate fluid intake
Pregnant and lactating women	Malnutrition, micronutrient deficiency	Not recommended
History of eating disorders	Psychological stress, overeating	Psychological support, nutritionist supervision

Thus, IG is a safe method for most patients with type 2 diabetes, provided they follow medical recommendations and maintain glycemic control. Proper selection of the regimen and physician supervision minimize risks and increase the effectiveness of the method.
Intermittent fasting (IF) is a promising method for correcting insulin resistance and glycemic control in patients with type 2 diabetes. However, further research is needed to confirm the long-term efficacy and safety of IF. Patients considering IF should do so under medical supervision to minimize risks and achieve optimal results.

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