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ORIGINAL RESEARCH

Alterations in basal and postprandial insulin secretion and clearance in obese patients with type 2 diabetes mellitus - A review of the evidence

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ONLINE ARTICLE

ARTICLE INFORMATION

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1. ABSTRACT

The analyzed study examined 348 people with type 2 diabetes mellitus who were overweight or obese, comparing them with matched non-diabetic controls. The goal was to distinguish the amount of insulin produced by the pancreas from insulin clearance, i.e., the rate at which the hormone is removed from the blood. The results indicate that, in diabetes, higher basal insulin levels are primarily due to reduced clearance. After a meal, however, the early response worsens with the duration of the disease; in later stages, secretion may be much higher, but increased clearance can keep peripheral insulin relatively contained.This observation contributes to the narrative of “The Choice to Live in Health or Illness” by Dr. A. Colonnese and R. Panzironi: the value of insulin in the blood does not necessarily coincide with the amount secreted by the pancreas. Independent studies confirm that in type 2 diabetes, secretion, insulin sensitivity, and clearance change together, but they also show that the direction of postprandial clearance varies based on obesity, stage of diabetes, glycemia, and measurement method. The confirmation is therefore moderate and contextual.

MISSION

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Through articles, reviews, in-depth analyses and expert contributions, the Journal champions evidence-based medicine and science, fostering a correct interpretation of scientific data and countering misinformation. Every piece of content is developed with the aim of translating the complexity of research into understandable, useful and applicable information, while keeping intact the principles of accuracy, transparency and scientific independence.

Free from political, industrial and commercial influence, the journal stands as an authoritative and independent editorial space, dedicated to promoting scientific culture, professional development and the growth of health awareness among the public.

2. ANALYZED STUDY

The research question was whether the insulin alterations observed in people with overweight or obesity without diabetes were also present in type 2 diabetes. The authors separately evaluated insulin secretion, i.e., the release of the hormone into the circulation by pancreatic beta cells, and insulin clearance, i.e., its removal from the blood, primarily by the liver.The point relevant to paragraph 3.4 of "The Choice to Live in Health or Illness" by Dr. A. Colonnese and R. Panzironi concerns the post-meal period. The study suggests that, in people with longer-standing diabetes, a delayed and even very high secretion may not translate into proportionally high peripheral insulin concentrations because the elimination of the hormone increases. In simple terms, what is measured in peripheral blood may be lower than what the pancreas has actually released.The study can describe differences between people with diabetes and controls and relate these differences to the duration of the disease. However, it cannot prove that increased clearance is the cause of beta-cell deterioration, nor can it establish an individual causal sequence, as the available material does not report a prospective design.

3. MATERIALS AND METHODS OF THE ORIGINAL STUDY

The available material consists only of the abstract. The study analyzed a random sample of 348 patients with type 2 diabetes, described as overweight or obese, and compared them with matched non-diabetic controls. Participants were considered in relation to body mass index (BMI) classes (the ratio of weight to height used to classify body weight) and the duration of diabetes.The authors evaluated fasting and post-meal plasma insulin concentrations, insulin secretion, and insulin clearance. They also distinguished between an early and a late postprandial response, defining the latter as the area under the curve between 90 and 180 minutes. The area under the curve summarizes the overall exposure to a substance over time.The number of non-diabetic controls, the type of meal or test used, the inclusion and exclusion criteria, the data collection period, the analytical techniques, the BMI class values, the formulas for calculating secretion and clearance, the detailed statistical analyses, and the P-values are not reported in the available material.

4. RESULTS

In a fasting state, plasma insulin concentrations were significantly higher in most BMI classes of people with diabetes compared to matched non-diabetic controls. According to the authors, the weight-associated increase in basal insulin was primarily due to reduced clearance rather than increased secretion. In other words, a significant portion of insulin remained in circulation for longer.After a meal, however, insulin concentrations were lower in patients with diabetes and did not increase with BMI as they did in non-diabetic controls. The reduction in postprandial clearance associated with weight gain, observed in subjects without diabetes, was not present in people with type 2 diabetes.At the time of diagnosis, basal insulin was higher compared to controls, while basal secretion was comparable; according to the abstract, this pattern did not change with the duration of diabetes. The early insulin response after a meal was initially comparable to controls but decreased as the disease progressed. This is consistent with a progressive worsening of beta-cell function, i.e., the pancreatic cells that produce insulin.The central finding for the book's section concerns the late postprandial phase. At diagnosis, between 90 and 180 minutes, insulin secretion and concentration were significantly higher compared to controls. With a longer duration of diabetes, a roughly threefold late secretion was instead associated with comparable peripheral concentrations, because postprandial clearance was significantly higher. The abstract does not report the absolute values, confidence intervals, or P-values for these differences.

5. INTERPRETATION

The main result indicates that insulin measured in an arm vein is not a direct snapshot of pancreatic secretion. The circulating amount depends on two processes: how much hormone is released and how quickly it is extracted and degraded. If clearance increases, high secretion may produce only a moderate blood value; if clearance decreases, a high value may appear even without a corresponding increase in secretion.In the specific segment supported by the study, the chain is: longer duration of diabetes

deterioration of the early beta-cell response compensatory or late increase in secretion greater postprandial clearance peripheral concentration that underestimates actual secretion. The directly observed data is the association between longer duration of diabetes, impaired early response, and the dissociation between high late secretion and comparable peripheral insulin.This interpretation is consistent with the passage from "The Choice to Live in Health or Illness" by Dr. A. Colonnese and R. Panzironi, but it does not imply that every person with diabetes presents the same profile. Clearance depends on the liver, kidneys, the amount of insulin reaching the tissues, insulin sensitivity, and the method used to estimate it. Therefore, the plasma insulin value alone does not allow for a certain reconstruction of individual pancreatic secretion.

6. INDEPENDENT SUPPORTING EVIDENCE

Independent confirmation of the loss of early insulin response in type 2 diabetes comes from an experimental study on 14 people with diabetes and 11 non-diabetic controls matched for age and BMI. During a mixed meal, the peak of insulin secretion was delayed and lower in people with diabetes, while the total integrated postprandial insulin response did not differ significantly between the groups. The result confirms that the problem does not concern only the total amount of insulin, but also the timing of its secretion [1].A second clinical study compared lean normoglycemic individuals and people with obesity at different stages of glycemic impairment, including type 2 diabetes. In people with diabetes, glucose-stimulated insulin secretion was reduced compared to obese groups with normal or impaired glycemia; insulin clearance was also directly associated with insulin sensitivity and inversely associated with the postprandial increase in secretion and plasma insulin. This confirms that secretion, clearance, and peripheral insulin must be interpreted together [2].The temporal component of the narrative is also supported by a prospective study of 732 people with newly diagnosed type 2 diabetes followed for three years. An increase in estimated insulin clearance during meal tests was independently associated with a more rapid worsening of glycated hemoglobin, along with the deterioration of insulin sensitivity and beta-cell function. The study does not prove that increased clearance causes glycemic worsening, but it confirms that its trend can change over time and accompany the progression of the disease [3].Taken together, these independent studies support the central part of the narrative: in type 2 diabetes, the postprandial insulin response cannot be read from blood concentration alone. The confirmation is more robust for the deterioration of early secretion and for the interdependence between secretion and clearance; it is less direct for the exact late increase in clearance reported in the original study.

7. CONFLICTING EVIDENCE

A secondary analysis of two randomized controlled trials investigated a standardized breakfast in 19 people with type 2 diabetes, 11 normoglycemic people with central obesity, and 12 lean normoglycemic people. After the meal, the mean insulin clearance was approximately 40% lower in both the group with diabetes and the group with obesity compared to the lean subjects. In the group with diabetes, clearance decreased slightly compared to pre-meal values [4].This result does not replicate the increase in late postprandial clearance observed in the original study. However, it is not a complete refutation, because the populations, duration of diabetes, the meal, the method of estimating clearance, and the time window analyzed were different. The original study emphasizes a late response associated with the duration of the disease; the subsequent study primarily describes the mean clearance and its immediate profile during a single meal.The available evidence therefore shows that postprandial clearance in type 2 diabetes is context-dependent. It may be lower compared to lean subjects in some cross-sectional comparisons, but increase over time or during specific phases of the disease and the postprandial response. This heterogeneity requires caution when turning a single metabolic profile into a general rule.

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

The table distinguishes the study under review from independent publications and shows that the direction of postprandial insulin clearance varies according to population, disease stage, and method of analysis.

Quadro comparativo

Reference	Study type	Population or model	Main result	Direction of evidence	Strength of evidence
Original study	Comparative observational	348 patients with type 2 diabetes and matched non-diabetic controls	With longer diabetes duration, late secretion is approximately tripled and peripheral insulin is comparable due to higher postprandial clearance	direct confirmation	moderate
[1]	Clinical experimental study	14 people with type 2 diabetes and 11 matched controls	Postprandial secretory peak delayed and reduced in diabetes; total integrated response not different	indirect confirmation	moderate
[2]	Physiological clinical study	19 lean people and 87 people with obesity, including 18 with type 2 diabetes	In diabetes, glucose-stimulated secretion decreases; clearance correlates with sensitivity, secretion, and plasma insulin	indirect confirmation	moderate
[3]	Prospective observational study	732 people with newly diagnosed type 2 diabetes followed for three years	Increased estimated clearance during meal tests associated with more rapid worsening of glycated hemoglobin	indirect confirmation	moderate
[4]	Secondary analysis of randomized controlled trials	19 people with type 2 diabetes, 11 with central obesity, and 12 normoglycemic lean subjects	Mean postprandial clearance approximately 40% lower in diabetes compared to lean subjects	discordant evidence	moderate

9. SINTESI EDITORIALE E CONCLUSIONI

CONCLUSIONS

The study analyzed specifically supports the idea that, in type 2 diabetes, the amount of insulin detected after a meal may not correspond to the amount secreted by the pancreas. As the disease progresses, the early response tends to deteriorate, and clearance can play a significant role in determining peripheral insulin levels.Independent evidence confirms quite well that secretion and clearance must be considered together and that beta-cell function worsens along the diabetes continuum. The demonstration that late clearance increases in the same way in all people with diabetes, however, remains moderately supported and dependent on the clinical and methodological context.

Aggiornato al 17/11/2026. Questo contenuto riflette una sintesi divulgativa delle evidenze scientifiche al momento della pubblicazione e non sostituisce il parere medico.

10. TRANSPARENCY AND SCIENTIFIC RESPONSIBILITY

Artificial Intelligence was used solely as a tool for editorial and documentary support. All content, interpretations, bibliographic citations and conclusions have been verified, reviewed and approved by the author, who assumes full scientific responsibility for them.

The manuscript was also subjected to independent peer review prior to publication.

To ensure the greatest transparency, the complete history of the article, including the dates of submission, revision, acceptance and publication, as well as information on the peer review process, is available on the dedicated Article History page.

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