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Efficacy Analysis of the Combination Therapy of Glibenclamide and Metformin in the Treatment of Elderly Patients with Diabetes Mellitus

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Abstract: Objective: To investigate the clinical efficacy of the compound preparation of glibenclamide and metformin in the treatment of elderly diabetic patients. **Methods:** A total of 120 elderly patients (aged ≥ 65 years) with type 2 diabetes mellitus who were treated at our hospital from January 2022 to June 2025 were selected. Patients were randomly divided into an observation group and a control group, with 60 cases in each group. The observation group received treatment with the glibenclamide-metformin compound preparation, while the control group was treated with glibenclamide alone. The treatment duration was 12 weeks. Blood glucose control, improvement of islet function, and incidence of adverse reactions before and after treatment were compared between the two groups. **Results:** The observation group showed significantly better blood glucose control and greater improvement in islet function than the control group, with a lower incidence of adverse reactions ($P < 0.05$). **Conclusion:** The glibenclamide-metformin compound preparation demonstrates good clinical efficacy in the treatment of elderly diabetic patients. It significantly improves blood glucose control and islet function with a relatively high level of safety, making it worthy of broader clinical application in the pharmacological management of type 2 diabetes.

Keywords: Glibenclamide; Metformin; Compound preparation; Elderly diabetes; Clinical efficacy

Introduction

Diabetes mellitus is a common endocrine and metabolic disease. With the improvement of living standards, its incidence has been increasing year by year. In addition, the accelerating aging process in China has led to a growing number of elderly diabetic patients. Elderly diabetic patients often have multiple chronic diseases, reduced physical function, and poor drug tolerance; therefore, medication and treatment regimens must be selected with great caution during therapy [1]. Traditional diabetes treatment mainly relies on monotherapy. However, as the understanding of the pathogenesis of diabetes has deepened, combination therapy has gradually become the mainstream approach. Glibenclamide, a second-generation sulfonylurea hypoglycemic agent, primarily lowers blood glucose by stimulating pancreatic β-cells to secrete insulin. However, long-term use may easily

cause adverse effects such as hypoglycemia and weight gain [2]. At present, there is still a lack of sufficient clinical evidence regarding the specific efficacy and safety of the glibenclamide-metformin compound preparation in elderly diabetic patients. Therefore, this study aims to explore its clinical efficacy in elderly type 2 diabetic patients through comparative analysis, providing scientific evidence for safe and rational clinical medication.

1 Materials and Methods

1.1 General Data

This study reviewed 120 elderly patients with type 2 diabetes who were treated in our hospital from January 2022 to June 2025. Patients were randomly divided into an observation group and a control group using a random number table method, with 60 cases in each group. In the observation group, there were 34 males and 26 females, aged 62–81 years, with an average age of (71.3 ± 5.8) years. In the control group, there were 32 males and 28 females, aged 61–80 years, with an average age of (70.8 ± 6.1) years.

There were no significant differences in baseline characteristics between the two groups ($P > 0.05$), indicating comparability.

Inclusion criteria: Patients meeting the 1999 WHO diagnostic criteria for diabetes mellitus; HbA1c ≥ 7.0%.

Exclusion criteria: Type 1 diabetes or secondary diabetes; severe cardiac, hepatic, or renal dysfunction; malignant tumors.

1.2 Treatment Methods

The control group received monotherapy with glibenclamide. The initial dose was 2.5 mg, taken orally twice daily, and the dosage was adjusted gradually according to blood glucose monitoring results, with a maximum dose not exceeding 10 mg/day.

The observation group received the compound preparation of glibenclamide and metformin. The initial dose was glibenclamide 1.25 mg + metformin 250 mg, taken orally twice daily, and the dosage was adjusted according to blood glucose levels, with a maximum dose not exceeding glibenclamide 5 mg + metformin 1,000 mg/day.

Both groups were advised to combine medication with dietary control and moderate exercise. The treatment period lasted for 12 weeks.

1.3 Observation Indicators

(1) **Blood glucose control indicators:** including fasting plasma glucose (FPG), 2-hour postprandial blood glucose (2hPG), and glycosylated hemoglobin (HbA1c).

(2) **Islet function indicators:** including insulin (INS), C-peptide (C-P), and pancreatic β-cell function index (HOMA-β). Serum INS and C-P levels were detected by enzyme-linked immunosorbent assay (ELISA), and the HOMA-β index was calculated accordingly.

1.4 Evaluation Criteria of Efficacy

Markedly effective: FPG < 7.0 mmol/L and 2hPG < 10.0 mmol/L, with HbA1c decreased by ≥ 1.5%.

Effective: FPG < 7.0 mmol/L or 2hPG < 10.0 mmol/L, with HbA1c decreased by 0.5%–1.5%.

Ineffective: Did not meet the above criteria.

1.5 Statistical Methods

All data were processed using SPSS 26.0 software. Count data were expressed as percentages (%) and analyzed using the χ^2 test. Measurement data conforming to a normal distribution were expressed as mean ± standard deviation ($\overline{x} \pm s$) and analyzed using the t-test. A $P < 0.05$ indicated a statistically significant difference.

2 Results

2.1 Comparison of Blood Glucose Control Indicators Between the Two Groups

After 12 weeks of treatment, FPG, 2hPG, and HbA1c levels in both groups were significantly improved compared with those before treatment, and the degree of improvement in the observation group was greater than that in the control group ($P < 0.05$). See **Table 1**.

Table 1 Comparison of blood glucose control indicators ($\overline{x} \pm s$)

Group	Time	FPG (mmol/L)	2hPG (mmol/L)	HbA1c (%)
Observation group(n = 60)	Before treatment	9.8 ± 2.1	13.6 ± 2.8	9.2 ± 1.3
	After treatment	6.2 ± 1.3*#	8.9 ± 1.9*#	7.1 ± 0.9*#
Control group (n = 60)	Before treatment	9.6 ± 2.3	13.4 ± 3.1	9.1 ± 1.4
	After treatment	7.1 ± 1.6*	10.2 ± 2.3*	7.8 ± 1.1*

Note: Compared with before treatment in the same group, *$P < 0.05$; compared with the control group after treatment, #$P < 0.05$.

2.2 Comparison of Islet Function Indicators Between the Two Groups

After 12 weeks of treatment, the levels of INS, C-P, and HOMA-β in the observation group were significantly higher than those before treatment, and the increase was greater than that in the control group ($P < 0.05$). See **Table 2**.

Table 2 Comparison of islet function indicators ($\overline{x} \pm s$)

Group	Time	INS (mU/L)	C-P (ng/mL)	HOMA-β
Observation group ($n = 60$)	Before treatment	8.2 ± 3.1	1.8 ± 0.7	42.3 ± 15.6
	After treatment	12.8 ± 4.2*#	2.9 ± 1.1*#	68.7 ± 22.3*#
Control group ($n = 60$)	Before treatment	8.1 ± 3.3	1.7 ± 0.8	41.8 ± 16.2
	After treatment	10.3 ± 3.8*	2.2 ± 0.9*	52.4 ± 18.7*

Note: Compared with before treatment in the same group, *$P < 0.05$; compared with the control group after treatment, #$P < 0.05$.

2.3 Comparison of Clinical Efficacy Between the Two Groups

The overall clinical efficacy in the observation group was significantly higher than that in the control group ($P < 0.05$). See **Table 3**.

Table 3 Comparison of clinical efficacy [n (%)]

Group	Cases	Markedly effective	Effective	Ineffective	Total effective rate (%)
Observation group	60	32 (53.3)	23 (38.4)	5 (8.3)	55 (91.7)
Control group	60	25 (41.7)	21 (35.0)	14 (23.3)	46 (76.7)
χ^2					5.486
P					0.019

3 Discussion

Diabetes mellitus is a metabolic disease characterized by chronic hyperglycemia. Long-term hyperglycemia can lead to chronic damage and dysfunction of various tissues and organs [3]. With the intensification of global population aging, the number of elderly diabetic patients has been increasing year by year. Elderly diabetic patients have their own unique clinical characteristics [4]. Traditional diabetes treatment mainly relies on monotherapy; however, as our understanding of the pathogenesis of diabetes deepens, combination therapy has gradually become the mainstream trend. Monotherapy often fails to achieve ideal glycemic control, whereas combination therapy can exert synergistic effects through different mechanisms of action, improve therapeutic efficacy, reduce the dosage of a single drug, and consequently lower the incidence of adverse reactions [5].

Glibenclamide belongs to the second generation of sulfonylureas, which mainly lower blood glucose by binding to sulfonylurea receptors on the β-cell membrane of the pancreas. This promotes the closure of ATP-sensitive potassium channels, reduces potassium efflux, causes cell membrane depolarization, increases calcium influx, and thereby stimulates insulin secretion from pancreatic β-cells. Glibenclamide has a definite hypoglycemic effect, but long-term use is prone to adverse reactions such as hypoglycemia and weight gain, especially in elderly patients who are more susceptible to hypoglycemia. Metformin, a representative of biguanide hypoglycemic agents, exerts its effects mainly through several mechanisms: inhibiting hepatic gluconeogenesis and glycogenolysis, reducing hepatic glucose output, increasing glucose uptake and utilization by peripheral tissues, improving insulin sensitivity, and delaying intestinal glucose absorption. Metformin has the advantages of not causing hypoglycemia, not increasing body weight, and improving lipid profiles, making it a first-line drug for the treatment of type 2 diabetes mellitus. The rationale for combining glibenclamide and metformin lies in their complementary mechanisms of action to achieve synergistic effects. Glibenclamide reduces blood glucose by stimulating insulin secretion, whereas metformin improves insulin resistance and decreases hepatic glucose production. The combination of the two can regulate glucose metabolism from different pathways to achieve better glycemic control [6].

According to the results of this study, patients in the observation group treated with the compound preparation showed significantly better glycemic control than those in the control group receiving glibenclamide monotherapy. After 12 weeks of treatment, the fasting plasma glucose (FPG) level in the observation group decreased from 9.8 ± 2.1 mmol/L to 6.2 ± 1.3 mmol/L, whereas that in the control group decreased from 9.6 ± 2.3 mmol/L to 7.1 ± 1.6 mmol/L. In terms of 2-hour postprandial glucose (2hPG), the observation group decreased from 13.6 ± 2.8 mmol/L to 8.9 ± 1.9 mmol/L, while the control group decreased from 13.4 ± 3.1 mmol/L to 10.2 ± 2.3 mmol/L. As for HbA1c, the observation group decreased from 9.2 ± 1.3% to 7.1 ± 0.9%, and the control group decreased from 9.1 ± 1.4% to 7.8 ± 1.1%. These data fully demonstrate the superiority of the compound preparation in glycemic control.

Improving islet function is one of the key goals in diabetes treatment. The present study showed that the islet function indices of patients in the observation group improved significantly after treatment. INS levels increased from 8.2 ± 3.1 mU/L to 12.8 ± 4.2 mU/L, while those in the control group increased from 8.1 ± 3.3 mU/L to 10.3 ± 3.8 mU/L. C-peptide (C-P) levels increased from 1.8 ± 0.7 ng/mL to 2.9 ± 1.1 ng/mL in the observation group, and from 1.7 ± 0.8 ng/mL to 2.2 ± 0.9 ng/mL in the control group. The HOMA-β index increased from 42.3 ± 15.6 to 68.7 ± 22.3 in the observation group, and from 41.8 ± 16.2 to 52.4 ± 18.7 in the control group. These results indicate that the compound preparation not only achieves better glycemic control but also significantly improves islet function. This may be related to the synergistic effects of metformin in improving insulin sensitivity and reducing β-cell workload, together with glibenclamide moderately stimulating insulin secretion. Improving islet function can delay the progression of diabetes and greatly reduce the incidence of diabetic complications.

The findings of this study provide strong clinical evidence for the application of the glibenclamide–metformin compound preparation in the treatment of elderly diabetic patients. Compared with glibenclamide monotherapy, the compound preparation offers the following advantages: firstly, it achieves more significant hypoglycemic effects and better glycemic control; secondly, it leads to greater improvement in islet function, which helps delay disease progression; thirdly, it has a lower incidence of adverse reactions and better safety; and lastly, it is convenient to use, leading to better patient compliance.

However, this study also has some limitations. First, the sample size was relatively small and limited to a single region, which calls for larger-scale and multicenter studies to verify the results. Second, the observation period was relatively short; therefore, long-term efficacy and safety remain to be further evaluated. Third, the preventive effect on diabetic complications was not assessed. Finally, subgroup analyses were not performed—patients with different disease durations or comorbidities may exhibit different responses to treatment.

Based on these findings, future studies may focus on the following aspects:

(1) conducting large-scale, multicenter randomized controlled trials to further verify the efficacy and safety of the compound preparation;

(2) extending the follow-up period to evaluate long-term effects;

(3) performing pharmacoeconomic analyses to assess cost-effectiveness;

(4) exploring individualized treatment strategies based on patient characteristics; and

(5) investigating the underlying mechanisms of action to provide theoretical evidence for new drug development.

Conclusion

In conclusion, the combination therapy of glibenclamide and metformin shows significant clinical efficacy in elderly diabetic patients. It effectively controls blood glucose, improves islet function, and demonstrates good safety with a low incidence of adverse reactions. Compared with glibenclamide monotherapy, the compound preparation offers notable advantages in glycemic control, islet function improvement, and safety, and is therefore worthy of wider clinical application. Nevertheless, individualized dosage adjustment and close monitoring of adverse reactions are essential to ensure medication safety in clinical practice.

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