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WJD mainly publishes articles reporting research results and findings obtained in the field of diabetes and covering a wide range of topics including risk factors for diabetes, diabetes complications, experimental diabetes mellitus, type 1 diabetes mellitus, type 2 diabetes mellitus, gestational diabetes, diabetic angiopathies, diabetic cardiomyopathies, diabetic coma, diabetic ketoacidosis, diabetic nephropathies, diabetic neuropathies, Donohue syndrome, fetal macrosomia, and prediabetic state.

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ORIGINAL ARTICLE

Retrospective Study

Sodium ozagrel and atorvastatin for type 2 diabetes patients with lacunar cerebral infarction

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Abstract

BACKGROUND

The main pathological factor of cerebral infarction is atherosclerosis, which is the pathological process of chronic inflammatory diseases such as vascular smooth muscle hyperplasia, inflammatory cell infiltration, extracellular matrix increase, and thrombosis. At present, the focus of clinical treatment is anti-platelet aggregation and improving blood status, and current research is limited to improving symptoms only.

AIM

To observe the effect of sodium ozagrel and atorvastatin on type 2 diabetes patients with lacunar cerebral infarction.

METHODS

Eighty-two patients with type 2 diabetes and lacunar cerebral infarction admitted to our hospital from January 2018 to February 2020 were equally categorized into two groups according to their treatment method. The control group was administered atorvastatin, and the observation group was administered sodium ozagrel combined with atorvastatin. The National Institutes of Health stroke scale (NIHSS) score, activities of daily living (ADL) score, blood glucose, lipid levels, inflammatory factors, high-mobility group box 1 (HMGB1) levels, paraoxonase-1 (PON-1) levels, erythrocyte sedimentation rate (ESR), and macrophage migration inhibitory factor (MIF) levels were recorded before and after treatment. The total effective rate and adverse reaction rate of the two groups were analyzed.

RESULTS

The total effective rate of the observation group (94.00%) was significantly higher than that of the control group (80.00%) ($\chi^2 = 3.998$; $P = 0.046$). The blood glucose indexes, total cholesterol levels, triglyceride levels, low-density lipoprotein cholesterol levels, high-sensitivity C-reactive protein levels, interleukin-1 β levels, tumor necrosis factor- α levels, HMGB1 Levels, ESR, MIF levels, platelet

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aggregation rates, and plasma viscosity of the two groups decreased after treatment; however, high-density lipoprotein cholesterol and PON-1 Levels increased after treatment. After treatment, the blood glucose indexes; blood lipid indexes; inflammatory factors; HMGB1, PON-1, and MIF levels; ESR; platelet aggregation rate; and plasma viscosity of the observation group were better than those of the control group ($P < 0.05$). After treatment, all patients in the observation group had higher ADL scores and lower NIHSS scores than those in the control group ($P < 0.05$).

CONCLUSION

Sodium ozagrel with atorvastatin can reduce inflammatory reactions; regulate ESR and HMGB1, PON-1, and MIF levels; control blood glucose and lipid indexes; and alleviate nerve injury without increasing adverse effects of atorvastatin alone.

Key Words: Sodium ozagrel; Atorvastatin; Type 2 diabetes; Lacunar infarction; Inflammatory response; Nerve damage

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Core Tip: This study was performed to observe the effect of sodium ozagrel combined with atorvastatin on high-mobility group protein B1 and high-sensitivity C-reactive protein in patients with type 2 diabetes mellitus and lacunar infarction. The purpose was to find a treatment plan that can effectively inhibit the pathological mechanism, alleviate clinical symptoms, improve the prognosis, and guide clinical treatment.

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INTRODUCTION

Type 2 diabetes is a common metabolic disease that is often complicated by abnormal lipid metabolism[1]. Abnormal lipid metabolism is one of the pathological causes of cerebrovascular disease. Consequently, type 2 diabetes mellitus complicated with cerebral infarction is commonly encountered in clinical settings[2]. Lacunar infarction refers to lesions and occlusion of the small perforating artery in the deep part of the cerebral hemisphere or brainstem. It results in minor harm because the perforating artery supplies only a small area. Active symptomatic treatment can help reduce the degree of disability. Statins can effectively regulate blood lipids and reduce the degree of vascular lesions[3]. However, the effect of statins alone is not ideal.

As an antiplatelet drug and thromboxane A inhibitor, sodium ozagrel is widely used to treat ischemic cerebrovascular diseases. It has been reported that sodium ozagrel combined with atorvastatin calcium is effective for treating type 2 diabetes mellitus with lacunar infarction without increasing adverse drug reactions[4]. However, research has been limited to the improvement of symptoms only, and its mechanism of action has not been investigated in depth. This study aimed to observe the effects of sodium ozagrel combined with atorvastatin on high-mobility group protein B1 (HMGB1) and high-sensitivity-C reactive protein (hs-CRP) in patients with type 2 diabetes mellitus and lacunar infarction.

MATERIALS AND METHODS

General information

Eighty-two patients with type 2 diabetes mellitus and lacunar infarction treated at our hospital from January 2018 to February 2020 were categorized into two groups according to the method of treatment (41 patients in each group). There were 24 males

and 17 females in the control group. Their ages ranged from 34 to 68 years (58.69 ± 9.22 years). The mean body mass index (BMI) was 24.15 ± 2.03 kg/m². Type 2 diabetes had been diagnosed between 1 and 10 years previously (5.69 ± 1.74 years). The mean National Institutes of Health Stroke Scale (NIHSS) score was 15.23 ± 2.33 . In the observation group, there were 22 males and 19 females. Their ages ranged from 38 to 69 years (59.17 ± 10.45 years). The mean BMI was 24.09 ± 2.14 kg/m². Type 2 diabetes had been diagnosed 1 to 10 years previously (5.61 ± 1.85 years). The mean NIHSS score was 14.96 ± 2.17 . There were no significant differences in the general data of the two groups ($P > 0.05$).

Inclusion and exclusion criteria

Inclusion criteria were as follows: Type 2 diabetes meeting the criteria of the Chinese guidelines for the prevention and treatment of type 2 diabetes mellitus[5]; lacunar infarction conforming to the criteria of the European treatment guidelines for acute cerebral infarction and confirmed by cranial computed tomography and/or magnetic resonance imaging[6]; age 18 years or older and younger than 70 years; and complete clinical data.

Exclusion criteria were as follows: Mental illness or serious communication disorders; recent history of surgery or diseases with bleeding tendencies; serious diseases of the heart, liver, kidney, and other organs; malignant tumors and systemic infection; pregnancy and lactation; and allergies.

Medications and instruments

The following medications and instruments were used: atorvastatin calcium tablets (10 mg; H19990258; Beijing Jialin Co., Ltd.); sodium ozagrel (20 mg; H20093400; Guangdong Pidi Pharmaceutical Co., Ltd.); ELX800 multifunctional enzmometer (Berten Company); BS634 platelet aggregation instrument (Beijing Biochemical Instrument Factory); and HT-100B blood rheometer (Hengtuo, Zibo).

Treatment and study design

Patients in both groups were administered symptomatic treatment to control blood glucose and blood pressure, nourish brain cells, and maintain water and electrolyte balance. Patients in the control group were treated with oral atorvastatin calcium tablets 10-20 mg once per day. The observation group was administered intravenous sodium ozagrel combined with atorvastatin. Atorvastatin was administered in the same dosage as that of the control group. Sodium ozagrel 80 mg was added to intravenous 0.9% sodium chloride and 500 mL intravenous drip twice per day. All patients were treated continuously for 2 wk to evaluate the curative effect.

Observation index and assessment methods

Changes in the NIHSS score; activities of daily living (ADL) score; blood glucose index; blood lipid index; inflammatory factors; HMGB1, paraoxonolipase-1 (PON-1), and macrophage migration inhibitor (MIF) levels; erythrocyte sedimentation rate (ESR); platelet aggregation rate; and plasma viscosity that occurred in the two groups were recorded before and after treatment. The total effective rate and adverse reaction rate of the two groups were calculated.

Fasting venous blood was obtained before treatment and 2 wk after treatment and divided into five samples. One sample was used to test the blood glucose and blood lipids using a Hitachi 7600 automatic biochemical analyzer. One sample was centrifuged at a rotational speed of 3500 rpm for 10 min, and hs-CRP, interleukin (IL)-1 β , tumor necrosis factor (TNF)- α , HMGB1, PON-1, and MIF in the serum were assayed using an enzyme-linked immunosorbent assay (American Boteng Company ELX800 multi-function enzyme label instrument; Nanjing Jiancheng Bioengineering Research Institute). One sample was tested using the Wechsler method to determine the ESR. One sample was tested using the BS634 platelet aggregation instrument (Beijing Biochemical Instrument Factory) to assess the platelet aggregation rate. One sample was tested using the Zibo Hengtuo HT-100B hemorheology instrument to assess plasma viscosity.

Curative effects

The NIHSS score[7,8] was used to determine the curative effect. If the NIHSS score decreased by $\geq 90\%$ after treatment, then the condition was considered cured. If the NIHSS score decreased between 45% and $< 90\%$ after treatment, then the condition was considered to have made significant progress. If the NIHSS score decreased between 18% and $< 45\%$ after treatment, then the condition was considered to have

made progress. If the NIHSS score decreased < 18% or if it increased, then no change or deterioration in the condition was considered. The total effective rate was calculated by adding the basic cure rate, significant progress rate, and progress rate.

NIHSS and ADL scores

The higher the NIHSS score, the more serious the degree of neurological impairment. NIHSS scores < 7 indicate mild defects, NIHSS scores 7-15 indicate moderate defects, and NIHSS scores > 15 indicate severe defects[9,10].

The ADL score[11,12] is determined based on the ability to independently defecate, urinate, perform basic grooming, eat, transfer from sitting to standing position, dress, climb stairs, and bathe. The total possible score is 100.

Statistical analysis

SPSS version 19.0 was used to process and analyze the data collected in this study. The NIHSS score; ADL score; blood glucose index; blood lipid index; inflammatory factors; HMGB1, PON-1, and MIF levels; ESR; and other measurements were evaluated. First, a normal distribution test was performed. Then, the measurements that were normally distributed or approximately normally distributed were evaluated using the χ^2 test. An independent sample *t* test was used for comparisons between groups, and a paired *t* test was used for comparisons within groups. Sex and the incidence of adverse reactions were expressed as percentages. The χ^2 test was used for comparisons between groups, and statistical significance was considered when *P* value was < 0.05.

RESULTS

After treatment, of the 41 patients in the control group, 8 cases (19.51%), 14 cases (34.15%), 8 cases (19.51%), and 11 cases (26.83%) were considered cured, to have made significant progress, to have made progress, and to have experienced no change or deterioration, respectively. Of the 41 patients in the observation group, 13 cases (31.71%), 17 cases (41.46%), 7 cases (17.07%), and 4 cases (9.76%) were considered cured, to have made significant progress, to have made progress, and to have experienced no change or deterioration, respectively, after treatment. The total effective rate of the observation group (94.00%) was higher than that of the control group (80.00%), and this difference was statistically significant ($\chi^2 = 3.998$; *P* = 0.046) (Figure 1).

Comparison of the blood glucose indexes between groups

Before treatment, the mean fasting plasma glucose (FPG) and plasma blood glucose (PBG) of the observation group were 8.81 ± 1.27 mmol/L and 11.24 ± 1.27 mmol/L, respectively. The mean FPG and PBG of the control group were 8.78 ± 1.23 mmol/L and 11.32 ± 1.05 mmol/L, respectively. There was no significant difference between the groups (*P* > 0.05). After treatment, the mean FPG and PBG of the observation group were 6.91 ± 0.79 mmol/L and 9.53 ± 0.88 mmol/L, respectively; the mean FPG and PBG of the control group were 7.32 ± 0.96 mmol/L and 10.23 ± 1.07 mmol/L respectively. The FPG and PBG of the observation group were lower than those of the control group, and the difference was statistically significant (*P* < 0.05). The FPG and PBG of the two groups decreased significantly after treatment (*P* < 0.05) (Figure 2A and B).

Comparisons of blood lipid indexes, platelet maximum aggregation rates, and plasma viscosity between groups

The high-density cholesterol levels of the two groups increased after treatment; furthermore, that of the observation group was higher than that of the control group after treatment. Total cholesterol levels, triglyceride levels, low-density cholesterol levels, maximum platelet aggregation rates, and plasma viscosity were lower after treatment, and all these values were lower in the observation group than in the control group (*P* < 0.05) (Table 1).

Comparison of NIHSS scores and ADL scores between groups

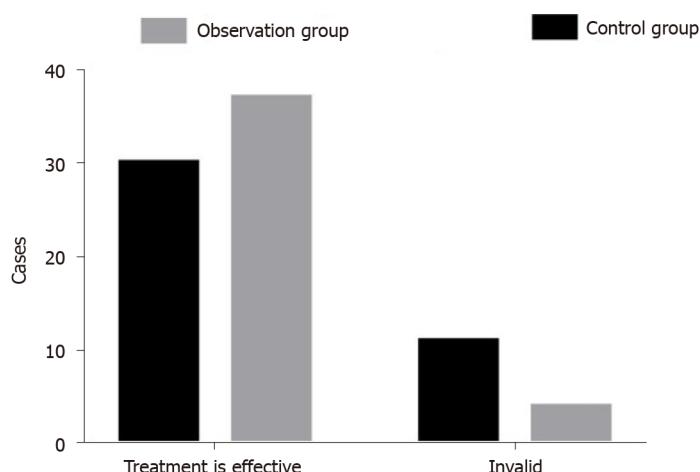
Before treatment, the mean NIHSS score and ADL score of the observation group were 14.96 ± 2.17 and 51.89 ± 7.54 , respectively, and those of the control group were 15.23 ± 2.33 and 54.25 ± 6.36 , respectively. There was no significant difference between the two groups (*P* > 0.05). After treatment, the NIHSS score and ADL score of the observation

Table 1 Comparison of blood lipid indexes, platelet maximum aggregation rate, and plasma viscosity between the two groups (mean ± SD)

Group		Control group (n = 41)	Observation group (n = 41)
TC (mmol/L)	Before treatment	6.52 ± 0.47	6.40 ± 0.56
	After treatment	5.17 ± 0.41 ^a	4.79 ± 0.32 ^{a,c}
TG (mmol/L)	Before treatment	2.92 ± 0.41	2.89 ± 0.45
	After treatment	2.05 ± 0.36 ^a	1.68 ± 0.31 ^{a,c}
HDL-C (mmol/L)	Before treatment	0.96 ± 0.31	0.95 ± 0.36
	After treatment	1.67 ± 0.37 ^a	1.95 ± 0.42 ^{a,c}
LDL-C (mmol/L)	Before treatment	4.25 ± 0.56	4.21 ± 0.53
	After treatment	3.37 ± 0.45 ^a	2.89 ± 0.39 ^{a,c}
Maximum platelet aggregation rate(%)	Before treatment	75.92 ± 9.64	78.40 ± 10.22
	After treatment	46.48 ± 7.26 ^a	58.30 ± 7.74 ^{a,c}
Blood plasma viscosity (mPa s)	Before treatment	1.86 ± 0.48	1.94 ± 0.43
	After treatment	1.40 ± 0.33 ^a	1.61 ± 0.35 ^{a,c}

^aP < 0.05 vs before treatment.^cP < 0.05 vs the control group.

TC: Total cholesterol; HDL-C: High density lipoprotein cholesterol; LDL-C: Low density lipoprotein cholesterol.

**Figure 1 Graph of effective and ineffective treatment of cases in both groups.**

group were 8.79 ± 1.65 and 78.26 ± 9.22 , respectively, and those of the control group were 10.23 ± 2.05 and 67.89 ± 7.98 , respectively. This difference was statistically significant ($P < 0.05$). The ADL scores increased and NIHSS scores decreased after treatment in both groups, and the difference was statistically significant ($P < 0.05$).

Comparisons of inflammatory factors and immune levels between groups

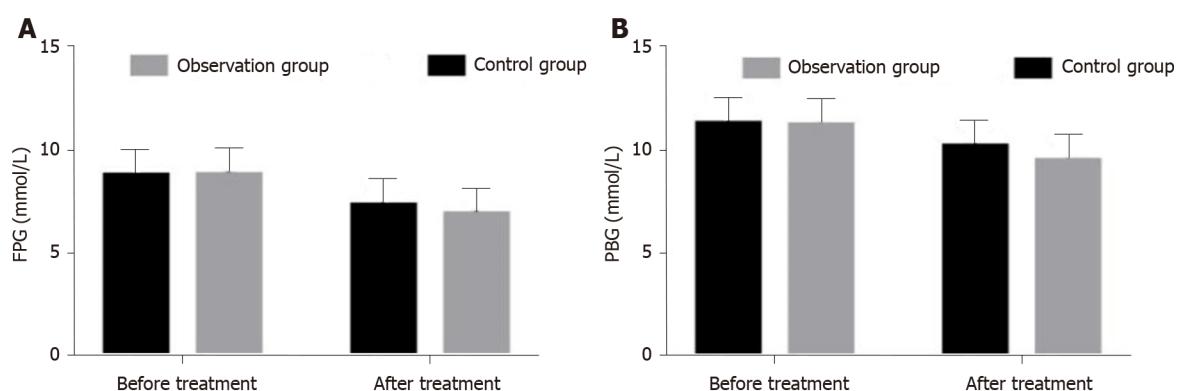
The PON-1 Levels increased after treatment and were higher in the observation group than in the control group. Furthermore, the hs-CRP, IL-1 β , TNF- α , HMGB1, and MIF levels and ESR decreased after treatment and were lower in the observation group than in the control group ($P < 0.05$) (Table 2).

Comparison of adverse reactions between groups

The rate of adverse reactions was 21.95% for the observation group and 17.07% for the control group ($\chi^2 = 0.311$; $P = 0.577$).

Table 2 Comparison of inflammatory factors and immune levels between the two groups (mean ± SD)

Group		Control group (n = 41)	Observation group (n = 41)
hs-CRP (mg/L)	Before treatment	10.63 ± 2.58	10.49 ± 2.44
	After treatment	7.23 ± 1.96 ^a	5.48 ± 1.67 ^{a,c}
TNF- α (pg/mL)	Before treatment	58.69 ± 6.32	59.02 ± 7.44
	After treatment	46.58 ± 5.24 ^a	37.02 ± 4.63 ^{a,c}
HMGB1 (μ g/L)	Before treatment	5.84 ± 0.56	5.81 ± 0.59
	After treatment	3.23 ± 0.52 ^a	2.94 ± 0.43 ^{a,c}
PON-1 (U/L)	Before treatment	135.23 ± 25.21	130.58 ± 22.17
	After treatment	159.63 ± 25.74 ^a	174.25 ± 31.02 ^{a,c}
ESR (mm/h)	Before treatment	32.15 ± 5.27	30.96 ± 6.42
	After treatment	19.36 ± 3.78 ^a	13.02 ± 4.11 ^{a,c}
MIF (ng/mL)	Before treatment	84.96 ± 5.87	86.02 ± 8.11
	After treatment	76.36 ± 6.14 ^a	68.21 ± 5.47 ^{a,c}

^aP < 0.05 vs before treatment.^cP < 0.05 vs the control group.hs-CRP: High-sensitivity-C reactive protein; TNF- α : Tumor necrosis factor-alpha; HMGB1: High-mobility group protein B1; PON-1: Paraoxonase-1; ESR: Erythrocyte sedimentation rate; MIF: Macrophage migration inhibitory factor.**Figure 2 Fasting plasma glucose and plasma blood glucose levels of both groups. A: Fasting plasma glucose levels; B: Plasma blood glucose levels. FPG: Fasting plasma glucose; PBG: Plasma blood glucose.**

DISCUSSION

Relationship between diabetes and lacunar cerebral infarction

Diabetes can cause metabolic disorders that seriously affect the quality of life[13-15]. Abnormal lipid metabolism caused by diabetes leads to atherosclerotic plaque in blood vessels and may cause cerebral infarction if there is atherosclerotic plaque in cerebral vessels[16-18]. Gap infarction is the most common type of cerebral infarction in diabetic patients and is one of the main causes of death[19]. Lacunar cerebral infarction occurs in the deep part of the cerebral hemisphere or the small perforating artery of the brain stem[20]. With long-term hypertension, vascular wall lesions occur, resulting in lumen occlusion and the formation of cystic lesions 0.2-15 mm in diameter; this diameter is slightly larger than the vascular diameter, thereby causing embolism, which is common in the elderly and especially in diabetic patients. Lacunar cerebral infarction mainly occurs in the putamen, caudate nucleus, internal capsule, thalamus, and pons. Because of the limited range of arterial blood supply, occlusion of a single branch cause only a small area of ischemic necrosis of brain tissue and lacunar infarction[21]. Clinically, lacunar infarctions are more common in patients with type 2 diabetes, and the treatment effect is poor. Re-infarction or other major vascular complications are prone to occur. Therefore, early detection and prevention are partic-

ularly important[22].

Relationships between inflammation, diabetes, and lacunar cerebral infarction

Diabetes is an inflammatory disease[23]. The important pathological causes of lacunar cerebral infarction are small cerebral artery atherosclerosis and atherosclerosis, which is a chronic vascular inflammatory disease[24]. hs-CRP, IL-1 β , TNF- α , and MIF are classical markers related to inflammation[25-32] and reflect the degree of inflammation in the body. When inflammation occurs in the body, serum levels of these markers increase. HMGB1 is a type of delayed inflammatory factor that can increase insulin resistance, lead to impaired glucose tolerance, promote tumor metastasis, and affect the blood-brain barrier permeability[33,34]. PON-1 is a calcium-dependent aromatic esterase that can hydrolyze lipid peroxides, protect low-density lipoprotein cholesterol from oxidative modification, and protect against cardiovascular and cerebrovascular diseases[35]. Lacunar infarctions often occur in the putamen, caudate nucleus, internal capsule, thalamus, pons, and other areas. Small perforator vessel wall lesions, stenosis, and occlusion form a small focus of infarction that only causes a small area of brain tissue damage and forms a "cavity" attributable to long-term hypertension and hyperlipidemia. Type 2 diabetes is an independent risk factor for cerebral infarction, and these two conditions often occur together. Common clinical manifestations include vertigo, limb numbness, and memory loss, resulting in a low degree of disability; however, these manifestations can occur repeatedly because the degree of neurological impairment associated with lacunar infarction is mild. During clinical treatment, attention should be focused on the regulation of lipids and improvement in microcirculation[36-39].

Use of atorvastatin

Actively administering symptomatic and supportive treatment is helpful for reducing the degree of disability. Statins can effectively regulate blood lipids and reduce the degree of vascular lesions[40,41]. Atorvastatin[42] selectively inhibits the activity of 3-hydroxy-3-methylglutaryl coenzyme A reductase and reduces total cholesterol and low-density lipoprotein cholesterol levels, thereby affecting the deformation and oxygen-carrying capacity of red blood cells, improving microcirculation, and promoting the recovery of neurological function. This drug has good lipid-regulating effects and pharmacological effects, such as protecting the vascular endothelium and antioxidative and anti-inflammatory properties[43-46].

Use of sodium ozagrel

Sodium ozagrel is an antiplatelet drug and thromboxane A inhibitor that can resist platelet aggregation, reduce blood viscosity, promote vasodilation to alleviate the blood hypercoagulable state, reduce thrombosis, and improve brain metabolism and microcirculation[46-49]. Ozagrel has an important role in the treatment of ischemic cerebrovascular disease and concomitant limb dyskinesia[47]. During this study, the total effective rate for patients treated with sodium ozagrel combined with atorvastatin was higher than that for patients treated with atorvastatin alone; also, the improvements in blood glucose and blood lipid indexes of patients treated with sodium ozagrel combined with atorvastatin were better than those of patients treated with atorvastatin alone[48]. Additionally, the ADL scores of patients treated with sodium ozagrel combined with atorvastatin were higher than those of patients treated with atorvastatin alone[49]. Moreover, the NIHSS scores of patients treated with sodium ozagrel combined with atorvastatin were lower than those of patients treated with atorvastatin alone. These results suggest that sodium ozagrel combined with statins may be better for controlling blood glucose and blood lipids, reducing the degree of nerve injury, and improving the self-care ability of patients with type 2 diabetes mellitus with lacunar cerebral infarction than treatment with statins alone. Ozagrel can selectively inhibit thromboxane synthase and prevent prostaglandin H2 from synthesizing thromboxane A2 to inhibit platelet aggregation and dilate blood vessels. As a result, ozagrel can increase the local perfusion in brain tissue and improve the abnormal energy metabolism caused by ischemia and hypoxia, thus reducing defects in neurological function. Blood hypercoagulability and high viscosity are risk factors for lacunar infarction. During this study, we assessed the platelet maximum aggregation rate and plasma viscosity and found that sodium ozagrel combined with atorvastatin for the treatment of type 2 diabetes mellitus with lacunar infarction can correct blood hypercoagulability and high viscosity and reduce the risk of lacunar infarction.

Inflammation is always present during the pathological process of type 2 diabetes and lacunar cerebral infarction. hs-CRP is a sensitive indicator of inflammation, and the hs-CRP serum level can reflect the degree of inflammation. Additionally, hs-CRP is associated with the severity of cardiovascular and cerebrovascular diseases. IL-1 β and TNF- α are both classical proinflammatory factors that can not only directly cause tissue inflammatory damage but also expand the inflammatory response by promoting the release of other proinflammatory factors. HMGB1 is a highly conserved nuclear protein that has an important proinflammatory role in inflammation. ESR is a routine index associated with the active stage of inflammation that reflects the sedimentation rate of red blood cells[25]. MIF is a marker associated with inflammation that releases proteolytic enzymes under the actions of cytokines and growth factors, promotes atherosclerosis, and affects plaque stability. PON-1 is a calcium-dependent aromatic esterase that can hydrolyze lipid peroxides, protect low-density lipoprotein cholesterol from oxidative modification, reduce the level of oxidized low-density lipoprotein, reduce the uptake of oxidized low-density lipoprotein by macrophages, reduce the formation of foam cells, and exert protective effects on cerebrovascular vessels. The levels of hs-CRP, IL-1 β , TNF- α , HMGB1, and MIF and ESR of patients treated with ozagrel combined with atorvastatin were lower than those of patients treated with atorvastatin alone. Moreover, their PON-1 Levels were lower than those of patients treated with atorvastatin alone. These results suggest that sodium ozagrel combined with statins is better for reducing inflammation and inhibiting atherosclerosis to treat type 2 diabetes mellitus with lacunar cerebral infarction than treatment with statins alone. This is because ozagrel can promote the conversion of prostaglandin H2 by endothelial cells to prostaglandin I2, regulate the balance of thromboxane A2 and prostaglandin I2, and reduce inflammation.

There was no significant difference in the rates of adverse reactions between groups. These results suggest that sodium ozagrel combined with statins does not increase the risk of adverse reactions. Type 2 diabetes mellitus with lacunar cerebral infarction is common in clinical settings. Although statins alone can alleviate the disease to a certain extent, they alone cannot achieve the ideal effect. The antiplatelet drug ozagrel was administered based on the routine treatment and lipid regulation of statins. Ozagrel is beneficial for regulating blood glucose and blood lipids, and reducing nerve injury. During this study, through the assessment of serum inflammatory indicators, it was clear that reducing inflammation and inhibiting atherosclerosis are important mechanisms for treating type 2 diabetes mellitus with lacunar cerebral infarction.

Although ozagrel has been used in combination with statins in previous clinical studies[50], most studies assessed only blood glucose or a single blood index. We assessed blood glucose, blood lipids, blood coagulation, ESR, NIHSS score, ADL score, inflammatory factors, and specific indicators, namely, HMGB1, PON-1, and MIF in a comprehensive analysis; we found that the combination of these two drugs has a good effect on blood glucose and blood lipids, reduces nerve injury, and reduces inflammation. Inhibition of atherosclerosis is an important mechanism for the treatment of type 2 diabetes mellitus complicated with lacunar infarction. Some limitations of our study should be recognized. These include the small sample size, the short follow-up time, and the lack of long-term curative effect observation. The results need to be verified with further larger scale studies and include other statins in combination with ozagrel.

CONCLUSION

Sodium ozagrel combined with atorvastatin for the treatment of type 2 diabetes mellitus with lacunar cerebral infarction can reduce inflammatory reactions and regulate the expression levels of HMGB1, PON-1, and MIF and ESR. Additionally, ozagrel can effectively control blood glucose and blood lipid indexes and reduce nerve injury, without increasing adverse reactions when compared to treatment with atorvastatin alone.

ARTICLE HIGHLIGHTS

Research background

Type 2 diabetes is a common metabolic disease that is often complicated by abnormal lipid metabolism.

Research motivation

As an antiplatelet drug and thromboxane A inhibitor, sodium ozagrel is widely used to treat ischemic cerebrovascular diseases.

Research objectives

We want to observe the effects of sodium ozagrel combined with atorvastatin on high-mobility group protein B1 (HMGB1) and high-sensitivity-C reactive protein (hs-CRP) in patients with type 2 diabetes mellitus and lacunar infarction.

Research methods

Eighty-two patients with type 2 diabetes mellitus and lacunar infarction treated were categorized into two groups according to the method of treatment (41 patients in each group).

Research results

After treatment, the blood glucose indexes; blood lipid indexes; inflammatory factors; HMGB1, paraoxonase-1, and macrophage migration inhibitory factor levels; erythrocyte sedimentation rate; platelet aggregation rate; and plasma viscosity of the observation group were better than those of the control group.

Research conclusions

Sodium ozagrel with atorvastatin can reduce inflammatory reactions.

Research perspectives

The results need to be verified with further larger scale studies and include other statins in combination with ozagrel.

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