Clinical Neuroscience Research, 2025, Volume 3, Issue 2
http://ojs.bbwpublisher.com/index.php/CNR
Online ISSN: 2981-8133

Study on the Clinical Effect and Safety of Ginkgo Dipyridamole Injection Combined with Hyperbaric Oxygen in the Treatment of Ischemic Optic Neuropathy

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Abstract: *Objective*: To analyze the effect of combining Ginkgo Dipyridamole Injection with hyperbaric oxygen in the treatment of patients with ischemic optic neuropathy, and to study the safety of this combined therapy. *Methods*: Sixty eligible patients were selected from the hospital as samples, with a fixed time period and randomized grouping. The control group received only Ginkgo Dipyridamole Injection as a therapeutic intervention, while the observation group received hyperbaric oxygen therapy in addition to Ginkgo Dipyridamole Injection. The effects of different treatment regimens were compared and analyzed. *Results*: The effective rate of treatment in the observation group was higher than that in the control group. After treatment, there were significant changes in visual field-related indicators compared to before treatment. In addition to a higher MS index in the observation group than in the control group, LV and MD indicators were lower in the observation group. The differences mentioned above were statistically significant ($P < 0.05$). There was no statistically significant difference in adverse reactions between the two groups ($P > 0.05$). *Conclusion*: Combining Ginkgo Dipyridamole Injection with hyperbaric oxygen can help patients with ischemic optic neuropathy achieve better treatment outcomes. Patients' visual fields improved significantly after combined therapy, highlighting the effectiveness of this treatment approach. The safety of the combined therapy can be guaranteed, demonstrating the significant value of this treatment plan.

Keywords: Ginkgo Dipyridamole injection; Hyperbaric oxygen; Ischemic optic neuropathy; Adverse reactions; Visual field changes

Online publication: May 28, 2025

1. Introduction

Ischemic optic neuropathy is a fundus disease that is relatively common among elderly people, especially those over 60 years old [1]. Analysis of this disease reveals a strong correlation between optic nerve ischemia and hypoxia, which can cause optic nerve damage, leading to negative developments in patients' vision and visual

fields, and further increasing the probability of disease occurrence. Clinically, this disease is often classified as anterior ischemic optic neuropathy and posterior ischemic optic neuropathy, which can occur in one or both eyes [2]. In addition to being common in elderly populations, the disease is more prevalent among women than men [3]. Affected patients may experience a gradual decline in vision. The onset of the disease is often sudden, with early optic disc swelling, a reddish appearance, and visual field defects limited to a specific quadrant of the optic disc [4]. It is essential to pay attention to this disease, recognize its negative impact on patients' vision, and actively correct and improve the condition to ensure patients' vision. Although there is no specific treatment for this disease, drug therapy can improve optic nerve blood circulation and enhance patients' visual function [5]. Some researchers have pointed out that using Ginkgo Dipyridamole Injection for the treatment of ischemic optic neuropathy can yield positive results [6]. However, there is still room for improvement in the efficacy of this monotherapy. Focusing on patient needs and striving to further enhance treatment effectiveness, the hospital proposes combining Ginkgo Dipyridamole injection with hyperbaric oxygen therapy based on clinical experience and relevant literature. This combined approach aims to improve the overall treatment effect for patients. To analyze the safety and practical effects of this combined therapy, the following study was conducted.

2. Materials and methods

2.1. General information

Patients with ischemic optic neuropathy admitted to our hospital from January 2020 to January 2023 were screened, resulting in a sample size of 60 cases. The patients were divided into a control group and an observation group using the envelope method, with equal numbers in each group. Statistical software analysis confirmed that the samples were balanced and comparable ($P > 0.05$). The data is shown in **Table 1**.

Table 1. Comparison of basic information (n, Mean ± SD)

Group	Number of cases	Female	Male	Age range (years)	Average age (years)
Control group	30	18	12	46~70	58.63 ± 2.74
Observation group	30	19	11	45~72	58.77 ± 2.85
x^2/t		0.070		-	0.194
P		0.791		-	0.846

Inclusion criteria: (1) Patients were diagnosed with ischemic optic neuropathy; (2) Patients were informed of the study details.

Exclusion criteria: (1) Presence of drug allergies or resistance to treatment methods; (2) Unable to provide accurate personal information.

2.2. Methods

All patients received basic treatment, which included glucocorticoid intervention and the use of neurotrophic drugs based on the specific conditions of the patients. In addition to the basic treatment, the two groups received different treatment regimens.

2.2.1. Control group

Only Ginkgo Dipyridamole Injection was used for treatment. Ginkgo Dipyridamole Injection (Shanxi Pude Pharmaceutical Co., Ltd., National Medical Approval Number H14023516) was administered intravenously by mixing 20 mL of the injection with 250 mL of normal saline. The infusion was performed once daily. The treatment course consisted of 12 days, with a 6-day interval between courses, for a total of 3 courses.

2.2.2. Observation group

In addition to the treatment received by the control group, the observation group also received hyperbaric oxygen therapy. Before hyperbaric oxygen therapy, patients were informed of the necessary precautions. They were guided into the hyperbaric oxygen chamber, given 0.5 mg of Nitroglycerin Tablets (Beijing Yimin Pharmaceutical Co., Ltd., National Medical Approval Number H11021022) to be taken sublingually, and instructed to wear an oxygen mask for pressurized air administration. The chamber pressure was set to 0.25 MPa, and the pressurization process lasted for 25 minutes. Patients inhaled pure oxygen twice, with each session lasting for 30 minutes. Between the two sessions, patients inhaled chamber air for 10 minutes, followed by a 25-minute decompression, for a total duration of 120 minutes. This treatment was performed once daily, with the same treatment course and interval as the control group.

2.3. Observation indicators

(1) Analyze and compare the efficacy of patient treatment. Evaluate the efficacy based on the recovery of visual acuity and changes in visual fields. If the patient's visual acuity returns to normal levels and the visual field is normal after treatment, it is considered as effective treatment; if the patient's visual acuity improves significantly and the scope of visual field loss is reduced by more than 50% compared to before treatment, it is considered as partially effective; all other situations are considered as ineffective treatment.

(2) Evaluate and compare visual field-related indicators before and after treatment. Key indicators include mean sensitivity (MS), loss variance (LV) of anterior and posterior visual fields, and mean defect (MD) of the visual field.

(3) Record and compare the adverse reactions caused by the treatment in terms of probability.

2.4. Statistical methods

Statistical software SPSS 24.0 was used to analyze and process the data. The measurement data and count data (%) of the patients were tested using *t* and chi-square tests, respectively. A *P*-value less than 0.05 was considered statistically significant.

3. Results

3.1. Comparison of treatment efficacy

The effective rate of treatment in the observation group was higher than that in the control group ($P < 0.05$), as shown in **Table 2.**

Table 2. Comparison of treatment efficacy [n(%)]

Group	Number of cases	Markedly effective	Effective	Ineffective	Effective rate
Observation group	30	19 (63.33)	11 (36.67)	0 (0.00)	30 (100.00)
Control group	30	17 (56.67)	9 (30.00)	4 (13.33)	26 (86.67)
x^2					4.285
P					0.038

3.2. Comparison of visual fields

After treatment, the patients' visual fields showed a significant improvement trend. Compared with the pretreatment values, both groups showed significant changes after treatment. Specifically, the MS in the observation group was higher than that in the control group, while the other indicators were lower than those in the control group ($P < 0.05$). The details are shown in **Table 3**.

Table 3. Comparison of visual fields (Mean ± SD)

Group	MD (dB)		MS (dB)		LV (dB)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Observation group (*n*=30)	11.78 ± 1.15	5.34 ± 0.55	14.86 ± 1.49	19.87 ± 2.01	24.54 ± 2.47	15.41 ± 1.56
Control group (*n*=30)	11.49 ± 1.13	7.48 ± 0.72	14.92 ± 1.53	16.88 ± 1.67	24.77 ± 2.53	18.95 ± 1.80
t	0.985	12.936	0.153	6.266	0.356	8.140
P	0.324	0.000	0.878	0.000	0.722	0.000

3.3. Comparison of adverse reactions

There was no statistically significant difference in adverse reactions between the two groups ($P > 0.05$). The details are shown in **Table 4**.

Table 4. Comparison of adverse reactions [n(%)]

Group	Number of cases	Metabolic disorder	Infection	Insomnia	Incidence rate
Observation group	30	1 (3.33)	0 (0.00)	1 (3.33)	2 (6.67)
Control group	30	1 (3.33)	1 (3.33)	1 (3.33)	3 (10.00)
x^2					0.218
P					0.640

4. Discussion

Ischemic optic neuropathy is a relatively common ocular fundus disease in ophthalmology, mainly manifesting as sudden vision loss and a sense of visual obscuration [7]. Relevant scholars believe that its occurrence has a certain correlation with the presence of corresponding underlying diseases in patients [8]. Some studies have pointed out that if patients have common diseases such as hypertension, diabetes, and cardiovascular diseases, long-term pathologies can

lead to a decrease in optic nerve artery perfusion pressure and an imbalance in intraocular pressure [9]. In this situation, ischemic optic nerve fibers can easily cause optic nerve atrophy, resulting in permanent visual impairment. To treat this disease, clinical interventions often involve the use of Western medications [10]. Attempting hyperbaric oxygen therapy in addition to standard treatment theoretically can produce better treatment results [11–12]. The principle of hyperbaric oxygen therapy is to improve the blood oxygen content of patients through pressurized oxygen administration, leading to positive changes in tissue oxygen saturation [13]. This treatment method effectively enhances tissue oxygen uptake capacity and improves patients' nerve cell repair function, which can further enhance the treatment effect when applied to patients with ischemic optic neuropathy.

The Ginkgo Dipyridamole injection used in the study has antioxidant properties, participates in vasodilation and vasoconstriction regulation, and plays a significant role in improving erythrocyte aggregation and regulating blood viscosity [14]. Simultaneously, ginkgolides in the medication can inhibit vascular endothelial damage, providing better control and intervention for microthrombus formation and platelet aggregation [15]. Currently, the use of this drug for the treatment of ischemic optic neuropathy has gained clinical recognition. Therefore, adding hyperbaric oxygen therapy on this basis can yield better results [16].

The study results indicate that both treatment groups demonstrated good safety performance. The reasonable control of adverse reactions suggests that the combination of hyperbaric oxygen and Ginkgo Dipyridamole injection does not produce a high incidence of adverse effects, highlighting its positive clinical significance. Regarding the actual treatment effect, the effective treatment rate reflects the positive outcomes of the therapies. The results indicate that the combined treatment is highly effective, suggesting that the treatment approach used in the observation group can further improve patients' conditions. In terms of changes in visual field-related indicators, the implementation of hyperbaric oxygen combined with Ginkgo Dipyridamole treatment can further enhance these indicators, leading to positive developments. Although both groups showed positive feedback, the numerical performance suggests that the observation group's actual treatment effect is more prominent, indicating the value of combined therapy.

5. Conclusion

In summary, the combined use of hyperbaric oxygen and Ginkgo Dipyridamole for the treatment of ischemic optic neuropathy offers outstanding overall treatment effects and safety. The necessity and enthusiasm for implementing this combined therapy are more fully reflected.

Disclosure statement

The author declares no conflict of interest.

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