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Original Article

Therapeutic effects of anti-VEGF drugs, combined with laser therapy, on diabetic retinopathy and its effects on choroid thickness

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Abstract: Objective: The aim of this study was to observe the therapeutic effects of anti-vascular endothelial growth factor (VEGF) drugs, combined with laser treatment, on diabetic retinopathy, evaluating its effects on choroidal thickness. Method: A total of 64 patients with diabetic retinopathy were randomly divided into groups A and B. Group A included 32 patients that received anti-VEGF drugs, combined with laser treatment. In group B, 32 patients received laser therapy alone. Therapeutic effects of the two groups, after treatment, were recorded. Results of intraocular pressure, vision, thickness of retinal nerve epithelium in the macular area, and choroid thickness under macular fovea in the two groups, at different treatment stages, were compared. Results: The visual acuity of group A, at 1 month after treatment and 3 months after treatment, was significantly higher than that of group B, with statistically significant differences ($P<0.05$). There were no significant differences in the visual acuity of group B before treatment, 1 week after treatment, 1 month after treatment, and 3 months after treatment ($P>0.05$). In group A, the thickness of the retinal nerve epithelium in the macular area was significantly lower than that of group B after 1 month of treatment and 3 months after treatment. Choroid thickness under the macular fovea of patients in group A, after 3 months of treatment, was significantly lower than that in group B, with statistically significant differences ($P<0.05$). Conclusion: The clinical efficacy of anti-vascular endothelial growth factor (VEGF) drugs, combined with laser treatment, on diabetic retinopathy is better than that of laser treatment alone.

Keywords: VEGF, laser therapy, diabetic retinopathy, choroid

Introduction

Diabetic retinopathy is a kind of microvascular fundus lesion unique to diabetic patients [1]. It is due to the increased viscosity of red blood cells in the blood of diabetic patients, leading to the blockage of retinal capillaries. Due to the lack of blood supply to the retina, it stimulates the growth of a large number of new blood vessels in the retina, resulting in various diabetic eye diseases [2, 3]. Relevant studies have shown that retinopathy is the main cause of blindness in diabetic patients [4]. Incidence of diabetic retinopathy is extremely high [5]. Thus, how to treat and prevent diabetic retinopathy has become the focus of much attention.

Laser therapy has been recognized as an effective method for treatment of diabetic retinopathy. It can inhibit the further development of existing new blood vessels and effectively reduce the generation of pathologic new blood vessels [6, 7]. The use of laser treatment alone causes damage to the patient's eyes, to a certain extent. Thus, the improvement in patient vision is still not ideal [8]. Laser therapy may cause physical stimulation to the retina. Serious complications may occur in the process of completion, affecting the treatment effects and even hindering the completion of subsequent laser therapy [9]. With the rapid growth of living standards and medical levels, a large number of experimental results have shown that, as an important cytokine that can promote the pathological neovascularization in the fundus, continuous increases in expression of vascular endothelial growth factor (VEGF) will lead to macular edema in diabetic patients [10]. In

recent years, a large number of clinical studies have shown that injections of an appropriate amount of anti-VEGF drugs have good clinical effects in the treatment of retinopathy [11]. This study aimed to observe the therapeutic effects of anti-vascular endothelial growth factor (VEGF) drugs, combined with laser therapy, on diabetic retinopathy, examining its effects on choroidal thickness.

Materials and methods

Patients

A total of 64 patients with diabetic retinopathy were randomly divided into groups A and B, using the random number table method. In group A, 32 patients received anti-VEGF drugs, combined with laser treatment. In group B, 32 patients received laser therapy alone. There were 15 males and 17 females in group A, with ages ranging from 39 to 73 years and an average age of 52.45±7.56. There were 16 males and 16 females in group B, with ages ranging from 42 to 69 years and an average age of 52.08±6.76. Inclusion criteria: All patients included were diagnosed as non-proliferative or proliferative diabetic retinopathy with focal or diffuse macular edema after clinical examinations, optical coherence tomography (OCT), and other examinations [11]. Exclusion criteria: Patients that underwent any retinal photocoagulation or intravitreal injections; Patients with other eye diseases; Patients with severe cardiovascular disease; Patients with other serious systemic diseases. All patients and families provided informed consent in advance. This study was approved by the Ethics Committee of Shandong Provincial Hospital affiliated to Shandong University.

Therapeutic method

Group B was treated with laser therapy alone. Levofloxacin hydrochloride eye drops (Zhongshan Branch of Zhuhai Federal Pharmaceutical Co., Ltd., drug approval number H20020327) were given to the affected eyes 2 days before laser surgery. The patients were treated with compound tropicamide eye drops (Handan Kangye Pharmaceutical Co., Ltd., drug approval number H20044926) in the half hour of laser surgery for mydriasis. Oxybuprocaine hydrochloride eye drops were given during laser surgery (Santen Pharmaceutical Co., Ltd., drug approval number J20100128) to provide topical anesthesia. Relevant parameters of the laser were then adjusted to an appropriate level. In the whole retinal photocoagulation, a frequency-doubled semiconductor laser (532 nm) (Zeiss Company, Germany) was used. The diameter of the rear pole was set to 100 um~200 um. The spot diameter of light spot in the middle and periphery was set to 200 um~350 um. Exposure time was set to 0.15 s~0.3 seconds and the working power was set as within the range of 100 MW~500 MW. Laser range: Photocoagulation from the outer edge of the 2 DD on the side of the macula, the upper and lower sides of the optic disc, and the 1.5 DD outside the nasal cavity to the equatorial ampulla. The interval between the spots was set to be 1 spot diameter. The total number of spots was controlled within the range of 1000 to 1500 and the total retinal photocoagulation was performed 3 or 4 times in total, once a week.

The methods and related parameters of laser instrument in group A are the same as those used for group B. However, patients in group A were treated with anti-VEGF drugs (Conbercept) as well.

The drug administration plan referred to the amount of laser surgery. First, after epidermal anesthesia, the affected eye was disinfected according to the standard of routine internal eye surgery. The conjunctival sac was rinsed with povidone iodine solution (iodophor) (Guangdong Hengjian Pharmaceutical Co., LTD., drug approval number H44023924). Puncturing was performed on the scleral surface of ciliary body at the supraorbital sclera of the patient. Next, 0.5 mg conbercept (Chengdu Kanghong Biotechnology Co., Ltd., drug approval number S20130012) was injected from the vitreous cavity. The puncture site was compressed at the completion of the operation for 5 minutes. After completion of the operation, the puncture site was pressed for 5 minutes. Patients then received levofloxacin eye drops (levofloxacin) (Santen Pharmaceutical (China) Co., Ltd., drug approval number J20150106) and pranoprofen (Shandong Haishan Pharmaceutical Co., Ltd. drug approval number H20093827) and were bandage properly. All patients were treated by the same experienced ophthalmologist.

Table 1. General baseline data of patients in both groups [n (%)]

Group	A group (n=32)	B group (n=32)	t/X^2	*P*
Gender			0.063	0.803
Male	15 (46.88)	16 (50.00)		
Female	17 (53.13)	16 (50.00)		
Age (years)	52.45±7.56	52.08±6.76	0.206	0.838
Weight (Kg)	57.55±6.40	59.28±5.12	1.194	0.237
Hypertension			0.063	0.803
Yes	17 (53.13)	16 (50.00)		
NO	15 (46.88)	16 (50.00)		
Type			0.000	1.000
Simpleness	0 (0.00)	0 (0.00)		
Proliferative	32 (100.00)	32 (100.00)		
Other drug use			0.000	1.000
Yes	0 (0.00)	0 (0.00)		
NO	32 (100.00)	32 (100.00)		
Routine blood				
Hb (gm/dl)	10.24±1.56	7.48±3.21	4.375	<0.001
RBC (×10^{12}/L)	4.28±0.53	6.02±0.12	18.110	<0.001
PLT (×10^9/L)	149.96±29.24	146.75±28.14	0.448	0.656
Liver function				
ALT (U/L)	22.05±11.38	20.43±10.58	0.590	0.558
AST (U/L)	19.28±9.25	18.02±7.66	0.594	0.555
Renal function				
TP (g/L)	125.48±12.69	76.54±10.21	17.000	<0.001
UREA (mmol/L)	8.13±1.22	4.34±1.96	9.286	<0.001
CRE (μmol/L)	183.04±37.45	93.38±19.01	12.080	<0.001
UA (μmol/L)	601.58±38.77	214.78±55.02	32.510	<0.001

Outcome measures

Clinical efficacy, intraocular pressure, visual acuity, thickness of retinal nerve epithelium in the macular area, and choroid thickness under macular fovea were monitored before treatment and 1 week, one month, and 3 months after treatment. Group A and group B were then compared. The clinical efficacy of group A and group B, after treatment for diabetic retinopathy, was evaluated using the classification and severity grading of diabetic retinopathy [12] and OCT examinations:

Cure refers to no hemorrhaging in the patient's fundus. The patient's visual acuity is the same as before onset or restored to 1.0 and the results of OCT examination show that the macular area of the eye is normal. Marked effect means that more than one-half of the fundus hemorrhaging has been absorbed. Results of OCT examination show that the macular area of the eye was generally normal and the patient's visual acuity recovered more than 4 lines. Effective means more than one-third but less than one-half of fundus hemorrhaging has been absorbed. Results of OCT examination show that the edema in macular area is improved and visual acuity recovered in 2~3 lines. Ineffective means that the patient's fundus hemorrhaging is the same as before treatment or the fundus hemorrhaging is aggravated and visual acuity is reduced.

Statistical methods

SPSS 19.0 (Beijing Boyi Zhixun Information Technology Co., LTD.) software was used for statistical analysis. Count data are represented by [n (%)] and were tested by x^2. Measurement data are expressed as ($\bar{x}$ ± s). Two-way analysis of variance (ANOVA) for repeated measures, followed by post-hoc Bonferroni's tests, was used to evaluate baseline data. Additionally, t-tests were used to compare data between the two groups. P<0.05 indicates statistical significance.

Results

General clinical data comparison between two groups

The comparison of general clinical data between the two groups showed no significant differences (P>0.05). Thus, the two groups were comparable. See **Table 1**.

Therapeutic effects of patients treated in group A and group B

Curative rates, markedly effective rates, effective rates, and total effective rates of patients in group A were significantly higher than those in group B. Differences in curative ratios and total effective rates between the two groups were statistically significant (P<0.05). Ther-

Table 2. Therapeutic effects of patients in the two groups after treatment [n (%)]

Group	n	Cure	Effective	Significant effect	Invalid	Total effective rate
A group	32	10 (31.25)	13 (40.61)	8 (25.00)	1 (3.13)	31 (96.88)
B group	32	2 (6.25)	11 (34.38)	12 (37.50)	7 (21.88)	25 (78.13)
X^2		6.564	0.267	1.164	5.143	5.143
P		0.010	0.606	0.281	0.023	0.023

Table 3. Intraocular pressure (mmHg) before and after treatment

Group	A group (n=32)	B group (n=32)	P
Before treatment	17.24±4.64	17.00±3.04	0.808
After 1 week of treatment	18.04±3.02	19.03±4.25	1.074
After treatment for 1 month	17.67±4.38	18.44±4.02	0.467
After 3 months of treatment	16.69±3.29	17.23±2.63	0.471
P	0.547	0.072	

apeutic inefficiency rates of patients in group A were significantly lower than in group B and differences were statistically significant (P<0.05). Present results show that the clinical efficacy of anti-VEGF drugs, combined with laser treatment, for diabetic retinopathy is better than laser treatment alone (**Table 2**). Intraocular pressure levels of patients in group A and group B were not statistically significant before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment (P>0.05).

Intraocular pressure and visual acuity at different times before and after treatment

Intraocular pressure at different times before and after treatment in the two groups: Intraocular pressure levels of patients in group A before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment were (17.24±4.64) mmHg, (18.04±3.02) mmHg, (17.67±4.38) mmHg, and (16.69±3.29) mmHg, respectively. Intraocular pressure rates of patients in group B before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment were (17.00±3.04) mmHg, (19.03±4.25) mmHg, (18.44±4.02) mmHg, and (17.23±2.63) mmHg, respectively. Comparisons between groups showed no statistically significant differences in intraocular pressure before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment in group A and group B (P>0.05). Intra-group comparisons showed that intraocular pressure levels of patients in group A and group B were not statistically significant before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment (P>0.05). Intraocular pressure levels of the two groups at 1 week after treatment were higher than before treatment. However, from 1 week after treatment to 3 months after treatment, it showed a gradual downward trend. Intraocular pressure levels of the two groups gradually returned to pre-treatment levels at the third month after treatment. Based on the above results, it was speculated that there were no significant differences in the effects of anti-VEGF drugs, combined with laser therapy, on intraocular pressure in patients with diabetic retinopathy, compared with those treated with laser treatment alone (**Table 3**).

Visual acuity at different times before and after treatment: The visual acuity of patients in group A before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment was (0.43±0.37), (0.46±0.36), (0.68±0.41), and (0.69±0.47), respectively. The visual acuity of patients in group B before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment was (0.44±0.38), (0.45±0.35), (0.46±0.38), and (0.46±0.38), respectively. There were no significant differences in visual acuity between the two groups before treatment and 1 week after treatment (P>0.05). Intra-group comparisons showed no statistically significant differences in visual acuity in group B before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment (P>0.05). The visual acuity of patients in group A gradually increased from before treatment to 3 months after treatment. The visual acuity of patients at 1 month after treatment and 3 months after treatment was different from before treatment and 1 week before treatment, with statistically significant differences (P<

Table 4. Visual acuity before and after treatment

Group	A group (n=32)	B group (n=32)	P
Before treatment	0.43±0.37	0.44±0.38	0.915
After 1 week of treatment	0.46±0.36	0.45±0.35	0.911
After treatment for 1 month	0.68±0.41*,#	0.46±0.38	0.030
After 3 months of treatment	0.69±0.47*,#	0.46±0.38	0.035
P	0.012	0.996	

Note: *indicates that the difference in visual acuity is statistically significant compared with 1 week before and 1 week before treatment (P<0.05). #indicates that the difference in visual acuity between this group and group B at the same time point was statistically significant (P<0.05).

Table 5. Thickness of retinal nerve epithelium in the macular region (μm)

Group	A group (n=32)	B group (n=32)	t	P
Before treatment	258.34±48.56*	250.77±44.26	0.652	0.517
After 1 week of treatment	240.36±46.37	255.00±46.36	1.263	0.211
After treatment for 1 month	235.76±40.88#	277.38±45.76@	3.837	<0.001
After 3 months of treatment	230.12±35.27#	251.68±44.39	2.151	0.035
F	2.568	2.479		
P	0.057	0.064		

Note: *indicates that the difference is statistically significant (P<0.05) compared with that of January after treatment and March after treatment. @indicates that the difference is statistically significant compared with that before and after treatment (P<0.05). #indicates that the difference in visual acuity between this group and group B at the same time point was statistically significant (P<0.05).

0.05). The above results suggest that the effects of visual acuity in patients with diabetic retinopathy treated with anti-VEGF drugs, combined with laser therapy, are better than those with laser treatment alone (**Table 4**).

Changes in thickness of the retinal nerve epithelium in the macular area at different times before and after treatment in the two groups

The thickness of retinal nerve epithelium in the macular area before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment was (258.34±48.56) μm, (240.36±46.37) μm, (235.76±40.88) μm, and (230.12±35.27) μm, respectively. The thickness of retinal nerve epithelium in the macular area before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment was (250.77±44.26) μm, (255.00±46.36) μm, (277.38±45.76) μm, and (251.68±44.39) μm, respectively. There were no significant differences in the thickness of retinal nerve epithelium in the macular area between the two groups before treatment and one week after treatment (P>0.05). The thickness of retinal nerve epithelium in macular area of patients in group A was significantly lower than that of group B at 1 month after treatment and 3 months after treatment. Differences were statistically significant (P<0.05). Intra-group comparisons showed that the thickness of retinal nerve epithelium in the macular area was gradually decreased from before treatment to 3 months after treatment. The thickness of retinal nerve epithelium in the macular area at 1 month after treatment and 3 months after treatment was significantly lower than that before treatment. Differences were statistically significant (P<0.05). The thickness of retinal nerve epithelium in the macular area of group B gradually increased from before treatment to one month after treatment. At 3 months after treatment, it gradually decreased to levels before treatment. Differences in retinal nerve epithelium in the macular area after treatment were significant, compared to before treatment and 3 months after treatment (P<0.05) (**Table 5**).

Changes of choroid thickness under the macular fovea at different times before and after treatment

Choroid thickness under the macular fovea of patients in group A before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment was (304.28±70.75) μm, (302.45±69.03) μm, (285.28±65.02) μm, and (265.14±66.85) μm, respectively. Choroid thickness under the macular fovea of patients in group B before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment was (306.30±69.86) μm, (319.30±75.24) μm, (310.74±70.46) μm, and (305.45±64.29) μm, respectively. Comparisons between groups showed no statistically significant differences

Table 6. Choroid thickness under the macular fovea (μm)

Group	A group (n=32)	B group (n=32)	t	P
Before treatment	304.28±70.75	306.30±69.86	0.115	0.909
After 1 week of treatment	302.45±69.03	319.30±75.24	0.934	0.354
After treatment for 1 month	285.28±65.02	310.74±70.46	1.502	0.138
After 3 months of treatment	265.14±66.85*,#	305.45±64.29	2.459	0.017
F	2.304	0.262		
P	0.080	0.853		

Note: *indicates that the difference is statistically significant compared with 1 week before and 1 week after treatment (P<0.05). #indicates that the difference in visual acuity between this group and group B at the same time point was statistically significant (P<0.05).

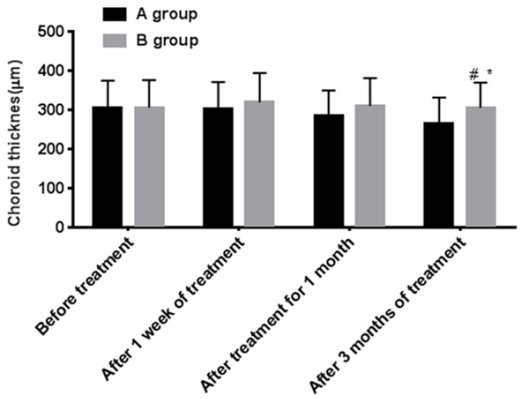

Figure 1. Changes in choroid thickness under the macular fovea of patients in the two groups at different times before and after treatment. Choroid thickness under the macular fovea after 3 months of treatment in group A was significantly lower than that in group B. Differences were statistically significant (P<0.05). There were no significant differences in choroidal thickness under the macular fovea of patients in group B before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment (P>0.05). Choroid thickness under the macular fovea in group A at 3 months after treatment was significantly different from that before treatment and 1 week after treatment (P<0.05). Note: *indicates that the difference in visual acuity is statistically significant compared with 1 week before and 1 week after treatment (P<0.05); #indicates that the difference in visual acuity between this group and group B at the same time was statistically significant (P<0.05).

in choroid thickness under the macular fovea before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment in group A and group B (P>0.05). Choroid thickness under the macular fovea in group A was significantly lower than that in group B after treatment (P<0.05). Intra-group comparisons showed that choroid thickness under the macular fovea in group B showed a gradual downward trend after reaching a peak 1 week after treatment. It was downregulated to pre-treatment levels and at 3 months after treatment. However, there were no significant differences in choroid thickness under the macular fovea of patients in group B before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment (P>0.05). Choroid thickness under the macular fovea of patients in group A gradually decreased before treatment and 1 week after treatment, 1 month after treatment, and 3 months after treatment. Choroid thickness under the macular fovea was significantly higher at 3 months after treatment than that at 1 week before and 1 week after treatment (P<0.05) (**Table 6**, **Figure 1**).

Discussion

Diabetic retinopathy is the most common complication of diabetes [13]. The long-term hyperglycemia state of diabetic patients causes partial retinal capillaries to lack oxygen, resulting in microvascular lesions in the fundus, eventually leading to diabetic retinopathy [14, 15]. The circulation of blood in the choroid occupies most of the eyeball and the metabolism is very vigorous. The choroid is capable of transmitting oxygen, heat, and nutrients needed for blood circulation, regulating the temperature of the outer layer of the retina [16, 17]. Related studies have shown that occurrence and development of such diseases, including choroid polypoid angiopathy and choroid macular degeneration, are closely related to changes in choroid thickness [18, 19]. Therefore, monitoring changes in choroidal thickness is of great clinical value in treating patients with diabetic retinopathy.

Therefore, this study aimed to explore the effects of anti-VEGF drugs, combined with laser therapy, and laser treatment alone on intraocular pressure, vision, thickness of retinal nerve epithelium in the macular area, choroid thickness under the macular fovea, and therapeutic efficacy in patients with diabetic retinopathy.

The present study calculated curative effects in group A and group B after treatment. Present results showed that curative rates, markedly effective rates, effective rates, and total effective rates of patients in group A were significantly higher than those in group B. Curative rates and total effective rates of the two groups were statistically significant. Thus, it was believed that the clinical efficacy of anti-VEGF drugs, combined with laser treatment, for diabetic retinopathy is better than with laser treatment alone. Many studies have shown that the combination of anti-VEGF drugs with laser therapy in the treatment of diabetic retinopathy is more conducive to the recovery of vision and improvement of treatment effects [20, 21]. Previous reports examining the effects of anti-VEGF drugs on visual acuity in patients with diabetic retinopathy have shown that the important cause for the generation of new blood vessels is abnormal expression of VEGF factor [22]. Studies have found that anti-VEGF drugs can block the formation of new blood vessels and accelerate the absorption of edema in the macular area by blocking the binding of VEGF factors to receptors associated with VEGF factors [23].

Monitoring the intraocular pressure and visual acuity of the two groups of patients before and after treatment, no significant differences were found in the effects of the two treatments on the intraocular pressure of patients with diabetic retinopathy. Patients that received anti-VEGF drugs, combined with laser treatment, had significantly higher visual acuity at 1 month after treatment and 3 months after treatment than those receiving laser therapy alone. The visual acuity of patients that received anti-VEGF drugs, combined with laser treatment, gradually increased from before treatment to 3 months after treatment. The visual acuity of patients 1 month after treatment and 3 months after treatment was different from that 1 week before treatment and before treatment, with statistically significant differences. Related studies have shown that diabetic patients with ocular complications, after receiving anti-VEGF drugs combined with laser treatment, show better recovery of intraocular pressure and vision than with laser treatment alone [25]. Therefore, based on the above results and related references, the current study suggests that the combination of anti-VEGF drugs and laser treatment for diabetic retinopathy patients can improve visual acuity better than laser treatment alone.

Finally, the current study monitored changes in the thickness of retinal nerve epithelium in the macular area and choroid thickness under the macular fovea, before and after treatment, in the two groups. Results showed that the thickness of retinal nerve epithelium in the macular area and choroid thickness under the macular fovea, before and after treatment, in group A showed a gradual downward trend. Compared with that before treatment, the thickness of retinal nerve epithelium in the macular area and choroid thickness under the macular fovea in patients of group B gradually increased, then gradually decreased to pre-treatment levels.

The thickness of retinal nerve epithelium in the macular area of patients in group A was significantly lower than that of group B after 1 month of treatment and 3 months after treatment. Choroid thickness under the macular fovea in group A was significantly lower than that in group B after 3 months of treatment, with statistically significant differences. According to relevant reports, the choroidal thickness of patients with diabetic retinopathy is significantly thicker than that of non-diabetic patients. Changes in choroid thickness is closely related to the function of the outer retina [24, 25]. Retinal laser surgery can increase the thickness of nerve epithelium under the macular fovea in patients with diabetic retinopathy in the early postoperative period, presenting as macular edema or aggravation of the original macular edema [26]. Thus, it is believed that laser treatment alone does not reduce preoperative trauma of laser surgery. For patients with diabetic retinopathy treated with anti-VEGF drugs, combined with laser therapy, the ability to block VEGF factor specific to anti-VEGF drugs can be used to alleviate symptoms of macular edema.

The current study, however, was unable to provide more detailed regulatory mechanisms for anti-VEGF drugs, combined with laser therapy, on diabetic retinopathy. Therefore, it has certain limitations. This study did not research the underlying mechanisms of anti-VEGF drugs, combined with laser therapy, in the treatment of diabetic retinopathy. Moreover, the number

of subjects included in this study was too small to be considered adequate data.

In summary, the clinical efficacy of anti-vascular endothelial growth factor (VEGF) drugs, combined with laser therapy, on diabetic retinopathy is better than that of laser treatment alone. Changes in thickness of retinal nerve epithelium in the macular region and choroid thickness under the macular fovea can be used as clinical indicators to monitor changes in patients with diabetic retinopathy. They can also be used to predict the therapeutic effects of diabetic retinopathy, to some extent.

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Disclosure of conflict of interest

None.

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