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【应用研究】

全视网膜光凝术对增生性糖尿病视网膜病变患者黄斑区视网膜功能的影响

时倩倩 刘华 付蓉花

作者简介:时倩倩,女,1978年5月出生,河南开封人,硕士,主治医师。研究方向:眼底病。联系电话:13938456338;E-mail:sqq800517@sina.com

About SHI Qian-Qian: Female, born in May, 1978. Master degree, attending doctor. Tel: 13938456338; E-mail: sqq800517@sina.com

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作者单位:450000 河南省郑州市,郑州人民医院眼科(时倩倩,付蓉花);451200 河南省巩义市,武警8680部队医院眼科(刘华)

From the *Department of Ophthalmology, People's Hospital of Zhengzhou* (SHI Qian-Qian, FU Rong-Hua), *Zhengzhou* 450000, *Henan Province*, *China*; *Department of Ophthalmology, the* 8680*th Hospital of Armed Police* (LIU Hua), *Gongyi* 451200, *Henan Province*, *China*

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Effects of panretinal photocoagulation on macular retina of patients with proliferative diabetic retinopathy

SHI Qian-Qian, LIU Hua, FU Rong-Hua

【Key words】 proliferative diabetic retinopathy; panretinal photocoagulation; multifocal electroretinography; optical coherence tomography

【Abstract】 **Objective** To observe and analyze the effects of panretinal photocoagulation on macular retina of the patients with proliferative diabetic retinopathy (PDR). **Methods** Sixty cases of patients (72 eyes) with PDR were selected as the observation group, while 60 normal subjects (60 eyes) were selected as the control group. All of the patients in the observation group were treated with panretinal photocoagulation. The optical coherence tomography was applied to observe the retinal macular thickness before and after operation, and the amplitude densities and latencies of P1 wave, N1 wave at 5 rings were tested by using multifocal electroretinogram. **Results** The postoperative and postoperative foveal retinal thickness in the observation group were (349.3±118.9) μm and (262.2±28.2) μm, respectively, there was statistical difference ($P<0.05$). The foveal retinal thickness in the control group was (136.4±17.8) μm, which were all lower than the postoperative and postoperative foveal retinal thickness in the observation group (all $P<0.05$). The postoperative amplitude densities of P1 wave at ring 1, ring 2 of the affected eyes in the observation group were higher than pre-operation (all $P<0.05$), but which at ring 3, ring 4, ring 5 were lower than pre-operation (all $P<0.05$). The postoperative latencies of P1 wave in the observation group were lower than pre-operation (all $P<0.05$). Compared with the control group, there were statistical difference in the postoperative latency of P1 wave at ring 1, ring 2 in the observation group (all $P<0.05$), but no statistical difference at ring 3, ring 4, ring 5 (all $P>0.05$). The postoperative amplitude densities of N1 wave at ring 1, ring 2 of the affected eyes in the observation group were higher than pre-operation (all $P<0.05$), but which at ring 3, ring 4, ring 5 were lower than pre-operation (all $P<0.05$). Compared with pre-operation, there was no statistical difference in the postoperative latency of N1 wave at ring 3 of the affected eyes in the observation group ($P>0.05$), but which at ring 1, ring 2, ring 4 and ring 5 were lower than pre-operation (all $P<0.05$). The preoperative and postoperative latencies of N1 wave in the observation group were all lower than those in the control group (all $P<0.05$). **Conclusions** Panretinal photocoagulation can significantly improve the sensitivity and conduction function of retinal surgery in the treatment of PDR patients, decrease the foveal retinal thickness, so as to achieve the purpose of improving vision.

【关键词】 增生性糖尿病视网膜病变;全视网膜光凝术;多焦视网膜电图;光学相干断层扫描

【摘要】 **目的** 观察全视网膜光凝术对增生性糖尿病视网膜病变(proliferative diabetic retinopathy,PDR)患者黄斑区视网膜功能的影响。**方法** 选取2011年1月至2013年12月我院收治的60例(72眼)PDR患者作为观察组,同时选取60例(60眼)正常志愿者作为对照组。观察组患者均应用全视网膜光凝术进行治疗。两组均行裂隙灯、验光、眼压、眼底等常规眼部检查,利用光学相干断层扫描(optical coherence tomography,OCT)检查黄斑区视网膜厚度,同时利用多焦视网膜电图(multifocal electroretinogram,mf-ERG)检查P1波、N1波5环的振幅密度及潜伏期等。**结果** 观察组患眼术前、术后黄斑中心凹视网膜厚度分别为(349.3±118.9)μm和(262.2±28.2)μm,差异有统计学意义($P<0.05$);对照组黄斑中心凹视网膜厚度为(136.4±17.8)μm,均显著低于观察组患眼手术前后黄斑中心凹视网膜厚度,差异均有统计学意义(均为$P<0.05$)。观察组患眼的1环、2环的术后P1波振幅密度较术前显著提高,差异均有统计学意义(均为$P<0.05$),而3环、4环、5环较术前显著降低,差异均有统计学意义(均为$P<0.05$)。观察组术后P1波潜伏期较术前均有一定程度的下降,差异均有统计学意义(均为$P<0.05$)。与对照组比较,观察组术后1环、2环的P1波潜伏期差异均有统计学意义(均为$P<0.05$);3环、4环、5环差异均无统计学意义(均为$P>0.05$)。观察组术后1环、2环的N1波振幅较术前显著提高,差异均有统计学意义(均为$P<0.05$);术后3环、4环、5环较术前显著降低,差异均有统计学意义(均为$P<0.05$)。观察组患眼术后3环的N1波潜伏期与术前比较,差异无统计学意义($P>$

0.05),术后1环、2环、4环、5环的N1波潜伏期均显著低于术前,差异均有统计学意义(均为$P<0.05$)。观察组术前和术后的N1波潜伏期均显著低于对照组,差异均有统计学意义(均为$P<0.05$)。**结论** 全视网膜光凝术治疗PDR患者可显著改善视网膜的感光和传导功能,降低黄斑中心凹视网膜厚度,从而达到部分改善视力的目的。

增生性糖尿病视网膜病变(proliferative diabetic retinopathy,PDR)是由糖尿病毛细血管损害引发的严重并发症之一,PDR的主要危害人群为中老年人群,是患者发生严重视力减退、甚至失明的重要原因之一。针对PDR的药物治疗一般很难取得显著的疗效,手术治疗是目前临床上比较常用的治疗方法,其中全视网膜光凝术(panretinal photocoagulation,PRP)是治疗PDR、改善患者视力的常用方法[1-3]。PRP属于损伤性治疗,对视网膜具有一定的创伤,因此观察PRP后黄斑区视网膜的功能变化具有一定意义,本研究利用光学相干断层扫描(optical coherence tomography,OCT)和多焦视网膜电图(multifocal electroretinography,mf-ERG)对PDR患者PRP后黄斑区视网膜功能变化进行观察,现将结果报告如下。

1 资料与方法

1.1 一般资料 选取2011年1月至2013年12月我院收治的60例(72眼)PDR患者作为观察组,其中男32例(38眼),女28例(34眼),年龄(61.3±6.9)岁;均排除屈光间质混浊、已接受玻璃体切割手术或激光治疗者。同时选取同期于我院健康体检的60例(60眼)正常志愿者作为对照组,其中男31例(31眼),女29例(29眼),年龄(59.6±8.6)岁,排除合并有角膜瘢痕、白内障、玻璃体积血等引发的屈光间质混浊和青光眼、高度近视等其他眼科疾病者。两组年龄、性别构成比例等方面比较,差异均无统计学意义(均为$P>0.05$),具有可比性。

1.2 治疗方法 观察组所有患者均接受PRP治疗,光凝范围为视盘上、下、鼻侧1 PD以外,颞侧上、下血管弓及黄斑中心凹颞侧2 PD以外至赤道部区域,光斑直径为200~500 μm,曝光时间0.2~0.3 s,以出现明显灰白色的Ⅲ级轻中度光斑为准,每两个光斑之间间隔1个光斑直径,每次光凝400~500点,治疗3~4次,每次间歇6~10 d。

1.3 观察指标

1.3.1 OCT检查 所有受试者均散瞳后用OCT仪(Stratus OCT,Dublin CA 94568 USA)检查双眼。每眼至少3次扫描,每次扫描均优化以获得高强度信号图像,选择信号最佳的一组图像保留进行数据处理。图像自动输入计算机,使用系统自带图像分析软件进行黄斑区视网膜厚度分析,选择视网膜厚度/体积分析程序自动分析,计算黄斑区以中心凹中心为圆心的直径1 mm范围内视网膜平均厚度。

1.3.2 mf-ERG检查 采用EP100电生理诊断图像分析系统(日本Tomey公司)。所有受试者均用美多丽散瞳,结膜表面麻醉,记录电极为角膜接触电极,参考电极置于前额正中,地电极置于耳后。对侧眼严密遮盖,以避免受到光照产生电反应。记录参数:放大器放大倍数100 K,低频截止为5 Hz,高频截止为100 Hz。检查眼注视固视点。采用随离心度增大的61个六边形阵列刺激图形,刺激时间每段47 s,记录8段。记录时摒弃因眼球运动、接触镜进气泡、瞬目或眼肌颤搐引起的伪迹。从系统软件提取对应于各个刺激单位的一阶反应波形,以中心凹为中心同心圆排列的5个环平均反应波,分析P1波、N1波5环的振幅及潜伏期。

1.4 统计学方法 采用SPSS 13.0统计软件包进行统计学分析,计量资料采用t检验进行分析比较,计数资料采用卡方检验进行分析比较,$P<0.05$为差异有统计学意义。

2 结果

2.1 两组黄斑中心凹视网膜厚度的比较 观察组患眼术前、术后黄斑中心凹视网膜厚度分别为(349.3±118.9)μm和(262.2±28.2)μm,差异有统计学意义($P<0.05$);对照组黄斑中心凹视网膜厚度为(136.4±17.8)μm,均显著低于观察组患眼手术前后,差异均有统计学意义(均为$P<0.05$)。

2.2 两组P1波振幅密度的比较 两组P1波振幅密度的比较见表1。观察组患眼的1环、2环的术后P1波振幅密度较术前显著提高,差异均有统计学意义(均为$P<0.05$),而3环、4环、5环较术前显著降低,差异均有统计学意义(均为$P<0.05$)。观察组患眼术前和术后P1波振幅密度均显著低于对照组,差异均有统计学意义(均为$P<0.05$)。

表1 两组P1波振幅密度的比较

Table 1 Comparison of amplitude density of P1 wave between two groups (Amplitude density/nV·deg^{-2})

Group	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5
Observation					
Pre-	24.8±12.8	15.7±10.9	16.3±3.8	12.7±4.2	8.6±3.0
Post-	36.2±13.1	25.4±11.9	11.2±4.8	7.5±3.5	6.2±3.2
Control	114.5±18.7	82.5±14.5	45.9±5.1	31.4±5.8	21.4±7.5

2.3 两组P1波潜伏期的比较 两组P1波潜伏期的比较见表2。观察组术后P1波潜伏期较术前均有一定程度的下降,差异均有统计学意义(均为$P<0.05$)。与对照组比较,观察组术后1环、2环的P1波潜伏期差异均有统计学意义(均为$P<0.05$);3环、4环、5环差异均无统计学意义(均为$P>0.05$)。

2.4 两组N1波振幅的比较 两组N1波振幅的比较见表3。观察组术后1环、2环的N1波振幅较术前显著提高,差异均有统计学意义(均为$P<0.05$);术后3环、4环、5环较术前显著降低,差异均有统计

学意义(均为 $P<0.05$);观察组术后 1 环的 N1 波振幅与对照组比较,差异无统计学意义($P>0.05$);观察组术前和术后 2 环、3 环、4 环、5 环的 N1 波振幅均显著低于对照组,差异均有统计学意义(均为 $P<0.05$)。

表 2 两组 P1 波潜伏期的比较

Table 2 Comparison of latency of P1 wave between two groups (t/ms)

Group	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5
Observation					
Pre-	36.5±11.4	38.6±7.2	40.1±6.5	43.4±6.5	41.8±5.2
Post-	28.6±6.9	25.5±6.0	35.7±5.8	34.8±5.8	34.8±4.5
Control	39.2±1.8	36.8±2.8	38.2±2.3	36.2±2.3	35.9±2.2

表 3 两组 N1 波振幅的比较

Table 3 Comparison of amplitude of N1 wave between two groups (U/mV)

Group	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5
Observation					
Pre-	0.26±0.11	0.12±0.10	0.20±0.08	0.19±0.08	0.25±0.12
Post-	0.52±0.18	0.32±0.12	0.14±0.10	0.15±0.09	0.15±0.10
Control	0.49±0.24	0.44±0.20	0.42±0.09	0.38±0.14	0.36±0.15

2.5 两组 N1 波潜伏期的比较 两组 N1 波潜伏期的比较见表4。观察组患眼术后3环的N1波潜伏期与术前比较,差异无统计学意义($P>0.05$),术后1环、2环、4环、5环的N1波潜伏期均显著低于术前,差异均有统计学意义(均为 $P<0.05$)。观察组术前和术后的N1波潜伏期均显著低于对照组,差异均有统计学意义(均为 $P<0.05$)。

表 4 两组 N1 波潜伏期的比较

Table 4 Comparison of latency of N1 wave between two groups (t/ms)

Group	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5
Observation					
Pre-	18.7±5.5	23.2±4.8	25.6±5.5	24.2±4.0	24.5±3.4
Post-	15.2±4.8	19.2±3.9	24.2±5.9	20.4±3.6	20.6±4.2
Control	37.5±3.6	38.2±3.4	36.4±2.2	36.8±2.4	38.2±2.1

3 讨论

PDR 是糖尿病最常见的微血管并发症之一,其主要发病机制是毛细血管壁的损害和血液成分的病理改变引发视网膜神经纤维肿胀、缺血坏死,进而出现新生血管、玻璃体积血、纤维增殖、视网膜牵拉性脱离等严重眼部病变,导致视网膜的感光和传导功能整体上受到影响,使患者的视功能下降[4]。PDR 的发生和发展不仅取决于代谢障碍的程度,而且与患者的发病年龄、病程长短、遗传因素和糖尿病控制情况等多种因素有关[5-6]。

PDR 患者术后的视力恢复情况与其病情的严重程度具有一定关系,一般来说,早期手术的疗效更好,PRP 可有效降低 PDR 的致盲率,也是临床上应用的常见治疗方法[7]。由于 PDR 致盲的主要原因是对视网膜的结构和功能的损害,因此,针对治疗方法的改善视网膜厚度和视网膜感光、传导系统的作用进行评价是十分必要的。OCT 是视网膜组织形态学的新型检查工具,具有非侵入性、非接触性、分辨率高、重复性好等优点,可以在活体直观的状态下准确地反映视网膜各层的微细结构并定量测量视网膜的厚度[8]。Mf-ERG 是一项视觉电生理的检查新技术,在最近几年迅速发展,它主要是采用数字技术同时分区刺激视网膜的不同区域,从而较快地获得各区域视网膜的电反应信号,并将各区的电反应情况绘制成三维立体地形图,以实现对视网膜不同部位功能的定量且直观的评价,特别是能够对黄斑部和后极部的视网膜功能进行定性和定量的检测[9-12]。这两种仪器对 PDR 的诊治技术、病因学、评估预后等方面的研究均具有较为重要的意义。

本研究结果显示,观察组患眼术后的黄斑中心凹视网膜厚度较术前显著降低($P<0.05$),但均显著高于对照组(均为 $P<0.05$);观察组患眼的 1 环、2 环术后 P1 波振幅密度较术前显著提高(均为 $P<0.05$),而 3 环、4 环、5 环较术前显著降低(均为 $P<0.05$),但观察组患眼的术前和术后的 5 环和 4 象限 P1 波振幅密度均显著低于对照组(均为 $P<0.05$);观察组术后的 1 环、2 环的 N1 波振幅较术前显著提高(均为 $P<0.05$),术后的 3 环、4 环、5 环和 4 象限的 N1 波振幅较术前显著降低(均为 $P<0.05$),观察组术前和术后的 N1 波振幅大部分显著低于对照组(均为 $P<0.05$);观察组术后的 N1 波潜伏期大部分显著低于术前(均为 $P<0.05$),观察组术前和术后的 N1 波潜伏期均显著低于对照组(均为 $P<0.05$)。上述结果说明,PDR 患者的视网膜神经纤维由于血管病变而发生肿胀、新生血管、增殖等病理变化,这些变化均对视网膜的厚度和 P1 波、N1 波的振幅及潜伏期产生影响。

激光作用的机制不仅是破坏直接光凝的视网膜组织,而且减少了邻近区域信号的传递[4]。这在 Nonaka 等[10]关于对大鼠进行激光治疗的研究中得到了证实,他们发现虽然只有一半的视网膜接受了激光治疗,但没有接受激光治疗的另一半视网膜的炎症反应也增加了。光凝后视网膜功能的下降可能与光凝直接损伤及视网膜水肿、炎症反应或自由基损害等因素有关。由于人们用 mf-ERG 所检测的视网膜后极部血管弓以内的区域并不是直接接受激光治疗的区域,所以 PRP 后黄斑功能发生改变的确切机制并不清楚,但已有相关研究报道 PRP 会导致视网膜和脉络膜循环血流速度的下降,这种血流速度的下降可能改变了黄斑区的电反应,今后还需要对 PRP 引起的黄斑区血循环和视功能的改变进行进一步研究[11]。

综上所述,PRP 治疗 PDR 患者可显著改善视网膜的感光和传导功能,降低黄斑中心凹视网膜厚度,从而达到部分改善视力的目的。

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【应用研究】

光凝前雷珠单抗玻璃体内注射对 CNV 患者黄斑区视网膜及视功能的影响

刘志南 邓国华 江一

作者简介:刘志南,男,1981 年 11 月出生,江苏常州人,主治医师。联系电话:13912342800;E-mail:1067019959@qq.com

About LIU Zhi-Nan: Male, born in November, 1981. Attending doctor. Tel: 13912342800; E-mail: 1067019959@qq.com

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作者单位:213001 江苏省常州市,常州市第三人民医院眼科
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From the *Department of Ophthalmology, the Third People's Hospital of Changzhou City, Changzhou* 213001, *Jiangsu Province, China*

Effects of ranibizumab intravitreal injection before photocoagulation on macular retina and visual function in patients with CNV

LIU Zhi-Nan, DENG Guo-Hua, JIANG Yi

【Key words】 ranibizumab; intravitreal injection; choroidal neovascularization; macular retina; visual function

【Abstract】 **Objective** To discuss the effects of ranibizumab intravitreal injection before photocoagulation on macular retina and visual function in patients with choroidal neovascularization (CNV). **Methods** A total of 100 cases of patients with CNV in our hospital from January 2012 to January 2014 were chosen, according to the different treatments, they were divided into the observation group and the control group, 50 cases in each group, the observation group was treated with intravitreal ranibizumab injection before photocoagulation, the control group with decaesadril and antibiotic eyedroping before photocoagulation, the patients were followed up from 3 months to 6 months after treatment, averaged 4 months, the change of CNV before and after the treatment of two groups and the change of macular retinal thickness and visual acuity change were observed. **Results** The total clinical efficiency rates of observation group and control group were 86.0% and 54.0%, respectively, the differences were statistically significant ($P<0.05$). The macular retinal thicknesses before the treatment in the observation group and control group were (351.2±10.3)μm and (351.3±10.2)μm, respectively, which after the treatment were (150.4±7.8)μm and (252.3±9.6)μm, respectively, there were statistical differences before and after treatment of two groups ($t=109.90$, 49.98; all $P<0.01$). The decreased degree of macular retinal thicknesses after the treatment in the observation group was better than that in the control group ($t=58.25$, $P<0.05$). The uncorrected visual acuity before the treatment in the observation group and control group were all 0.2±0.1, which after treatment were 1.0±0.3, 0.3±0.3, respectively, there were statistical there were statistical differences before and after treatment of two groups ($t=17.89$, 2.24; all $P<0.05$). The uncorrected visual acuity after treatment in the observation group was better than that in the control group ($t=13.33$, $P<0.05$). **Conclusion** Ranibizumab intravitreal injection before photocoagulation for patients with CNV can improve the visual acuity obviously, it contributes to the recovery of visual function and retinal morphology, clinical effect is exact.

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