

Clinical analysis of vitreous haemorrhage associated with retinal tears

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引用:胡迪,王一赛,丁婕,等. 玻璃体积血合并视网膜裂孔患者的临床特征分析. 国际眼科杂志 2021;21(11):1839-1842

Foundation items: National Natural Science Foundation of China (No. 82070977, 81400407); Natural Science Foundation of Anhui Province (No. 1408085QH159); Foundation of the First Affiliated Hospital of the University of Science and Technology of China (Anhui Provincial Hospital) (No.2019zc047)

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Received: 2020-04-12 Accepted: 2021-08-09

玻璃体积血合并视网膜裂孔患者的临床特征分析

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基金项目:国家自然科学基金项目(No.82070977,81400407);安徽省自然科学基金项目(No.1408085QH159);中国科学技术大学附属第一医院(安徽省立医院)院助项目(No.2019zc047)

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摘要

目的:研究玻璃体积血合并视网膜裂孔患者的临床特点,为早期干预和改善患者预后提供指导建议。

方法:回顾性分析2016/12-2018/12我院收治的105例105眼玻璃体积血合并视网膜裂孔患者,其中男54例,女51例,分析其临床特征,治疗效果和影响预后的相关因素。

结果:在105眼中共有151个视网膜裂孔,其中82个裂孔位于颞上象限(54.3%),28个位于鼻上象限(18.5%),27个位于颞下象限(17.9%),14个位于鼻下象限(9.3%)。视网膜裂孔的形状以马蹄形为主(77.5%)。裂孔直径

1/8~4PD之间,最常见的为1PD大小。76例(72.4%)视力优于或等于术前视力。术后矫正视力与术前比较无差异($P>0.05$);扣带组与玻璃体切除组相比,视力改善无差异($P>0.05$)。

结论:视网膜裂孔是玻璃体积血的重要原因。视网膜裂孔多位于颞上象限,以马蹄形为主。全面了解视网膜裂孔相关的玻璃体积血的临床特点,有助于早期发现视网膜裂孔,避免严重并发症的产生。如果术前最佳矫正视力(LogMAR)小于1.6并且光定位小于1m,术后视力则差。如果视网膜脱离累及黄斑,特别是伴增殖性玻璃体视网膜病变的患者预后也较差。

关键词:玻璃体积血;孔源性视网膜脱离;视网膜裂孔

Abstract

• **AIM:** To study the clinical characteristics of vitreous hemorrhage associated with retinal tears, so as to provide suggestions for early intervention and improving the prognosis of patients.

• **METHODS:** This was a retrospective study. Totally 105 patients (105 eyes) with vitreous haemorrhage associated with retinal tears treated at our hospital from December 2016 to December 2018 including 54 males and 51 females, of who the clinical characters, therapeutic effect and prognostic factors were retrospectively analyzed.

• **RESULTS:** Among the 105 eyes (151 retinal tears), 82 tears were located in the superotemporal area (54.3%), 28 tears were located in the superonasal area (18.5%), 27 tears were located in the inferior temporal area (17.9%), and 14 tears were located in the inferior nasal area (9.3%). The shape of the retinal tears was mostly horseshoe (77.5%). The diameter of the tear was between 1/8-4 papillary diameter (PD), most commonly is 1 PD. Seventy-six patients (72.4%) had visual acuity better than or equal to their preoperative vision. There was no significant difference in corrected visual acuity pre- and postoperative ($P>0.05$), and there was no statistically significant improvement in visual acuity between the buckling procedure group and the vitrectomy group ($P>0.05$).

• **CONCLUSION:** Retinal tear is an important cause of vitreous haemorrhage. Retinal tears were mostly located in the superotemporal area with horseshoe shape. A comprehensive understanding of the clinical characteristics of rhegmatogenous vitreous haemorrhage helps to detect tears early and avoid serious complications. Patients had preoperative best corrected visual acuity (BCVA) (LogMAR) less than 1.6 and light perception less than 1 m, have poor postoperative vision,

as do patients with retinal detachment involving the macula especially along with proliferative vitreoretinopathy (PVR).

• **KEYWORDS:** vitreous haemorrhage; rhegmatogenous retinal detachment; retinal tear

DOI:10.3980/j.issn.1672-5123.2021.11.01

Citation: Hu D, Wang YS, Ding J, *et al.* Clinical analysis of vitreous haemorrhage associated with retinal tears. *Guoji Yanke Zazhi (Int Eye Sci)* 2021;21(11):1839-1842

INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is a clinically common severe eye disease that can lead to blindness. According to statistics, vitreous haemorrhage occurs in approximately 7 per 100,000 people each year^[1]. Its pathogenesis is mainly a posterior vitreous detachment that stretches to form a retinal tear. The liquefied vitreous body enters the retina through the hiatus to create a retinal detachment. If the retinal blood vessels are torn, vitreous haemorrhage can occur. Studies have shown that acute spontaneous posterior vitreous detachment (PVD) is associated with 6%–18% of cases of retinal tear formation^[2]. At the initial diagnosis, due to excessive haemorrhage in the central vitreous body, the fundus cannot be seen, resulting in delayed diagnosis and treatment^[3]. If RRD is not treated in a prompt and effective manner, it can often lead to secondary uveitis, cataracts, low intraocular pressure, eye atrophy, and even blindness^[4]. Therefore, a comprehensive understanding of the clinical characteristics of patients with vitreous haemorrhage associated with retinal tears and timely treatment is of great significance for improving the visual prognosis as quickly as possible. This article retrospectively analyses the clinical data of 105 patients (105 eyes) in vitreous haemorrhage associated with retinal tears who were treated at our hospital from December 2016 to December 2018. As far as we know, this study is the first time to observe the shape of retinal tears and analyze the treatment effect. Our goal is to further obtain a comprehensive understanding of the clinical characteristics of RRD in order to preserve or improve patients' visual acuity.

SUBJECTS AND METHODS

General Materials We collected the clinical data of 105 patients in vitreous haemorrhage associated with retinal tears who were treated at our hospital from December 2016 to December 2018. The patients included 54 males and 51 females, aged 28–80 years, with an average age of 55.57 ± 10.79 years. All cases were monocular (52 right eyes and 53 left eyes), without any history of ocular trauma. Sixteen patients had a history of diabetes, and 4 had a history of hypertension. Preoperative refractive status was as follows: 94 cases of emmetropia, 11 cases of myopia. Regarding preoperative visual acuity, 54 cases were less than 1.6 LogMAR, 33 cases were between 1.6–1.0 (LogMAR), 11 cases were between 1.0–0.5 (LogMAR), and 7 cases were

0.5 LogMAR or better. The patients' retinal detachment status before and during operation were as follows: 65 cases with retinal detachment and 40 cases without retinal detachment. The duration of disease was 2–300 (average: 34.83 ± 44.87)d. This study complied with medical ethics requirements, and all patients signed informed consent.

Methods

Examination method Detailed medical history was collected before surgery. All patients underwent examinations that included visual acuity, intraocular pressure, slit-lamp, front mirror, fundus colour photography, A/B – scan ophthalmic ultrasound, computer optometry, and other tests. Data regarding the patient's age, sex, vision, onset time, location of tear, tear size, tear morphology, vitreous body status, eyes with ocular disease and systemic disease *etc.*, were recorded in detail and analysed. Patients with ruptured eyeballs, foreign bodies in the eye, history of retinal detachment surgery, severe hypertension, severe diabetes and coronary heart disease were excluded.

Treatment method After a comprehensive evaluation based on the retinal detachment status, the best surgical treatment plan is selected. For patients with optical media that is clear and a retinal tear that can be directly observed and is relatively small, scleral buckling was performed. For those with severe vitreous haemorrhage and those whose fundus cannot be observed clearly, combined vitreoretinal surgery is performed. In this study, 1 patient underwent simple scleral buckling, 6 patients underwent scleral buckling and scleral encircling, and 98 patients underwent vitrectomy (11 eyes were filled with long-acting C₃F₈ gas during surgery, and 61 eyes were filled with silicone oil). The retinal tear is mainly sealed by retinal laser photocoagulation during the operation, while peripheral tears are frozen outside the sclera to seal the tear. Vision assessment is based on BCVA. After vitrectomy, the prone position or the face – down position is strictly maintained for 3–4wk. All surgeries were performed by two equally experienced doctors. All patients were followed up for 6mo.

Statistical Analysis Statistical analysis was performed using SPSS17.0 software (SPSS, Inc., Chicago, IL, USA). All data are expressed as the mean±standard deviation. Independent samples *t*-test was used to analyse relevant data, and $P < 0.05$ was considered statistically significant.

Ethics Approval and Consent to Participate The study was conducted in accordance with the ethical principles specified in the Declaration of Helsinki and Good Clinical Practice Guidelines. This study was approved by the Institutional Review Board (IRB) in the First Affiliated Hospital of the University of Science and Technology of China (Anhui Provincial Hospital). Written informed consent was obtained from each patient prior to participation in the study.

RESULTS

B-scan Ophthalmic Ultrasound Findings Preoperative

Our study was performed with 10 MHz probe by the same operator. 105 cases were considered to be vitreous

haemorrhage, 62 (59.0%) cases accompanied by retinal detachment and 86 (81.9%) cases along with PVD. As for 76 patients we could not do slit-lamp fundus or indirect ophthalmology because of vitreous haemorrhage, there were 33 patients accompanied by retinal detachment with or without PVD according to B-scan. No retinal tear was found due to the existence of retinal detachment and vitreous haemorrhage as well as personal inexperience.

Location and Shape of Retinal Tears In this study, 82 retinal tears were located in the superotemporal area (54.3%), 28 were located in the superonasal area (18.5%), 27 were located in the inferior temporal area (17.9%), and 14 were located in the inferior nasal area (9.3%). Most of the tears were horseshoe-shaped (77.5%), 15.9% were round, and the rest were irregular. The diameters of the tears ranged from 1/8-4 papillary diameter (PD), and most were 1 PD. Sixty-nine eyes had a single tear (65.7%), while 36 had 2-7 tears (34.3%).

Status of the Fundus There were totally 76 patients we could not do slit-lamp fundus or indirect ophthalmology due to vitreous haemorrhage preoperative. 29 patients had relatively clear fundus, of which 7 cases had upper periphery retinal tear and underwent scleral buckling subsequently, while the retinal tear was near the posterior pole in another 22 cases that soon afterwards experienced par plana vitrectomy (PPV). Finally, 65 (61.9%) patients were been proven to have some degree of retinal detachment, including 14 cases (13.3%) with PVR. During vitrectomy, we found mild to moderate non-proliferative diabetic retinopathy without diabetic macular edema in 16 patients who had a history of diabetes, branch retinal vein occlusion without macular edema in 2 patients with hypertension, peripheral retinal lattice degeneration in 8 patients with myopia. Besides, 7 cases that had relatively clear fundus indicating retinal detachment and accepted PPV were confirmed to have more retinal tears than preoperative. Eighty-seven eyes had successful retinal reattachment after a single retinal surgery, and the reattachment rate was 82.9%. Among the patients who had scleral buckling, 2 eyes underwent a second buckling adjustment, and afterwards, the retina was reattached. Among the patients who underwent vitrectomy, poor retinal reattachment was observed in 9 eyes during follow up. The retinal reattachment was good after scleral encircling or C₃F₈ gas injection during silicone oil removal surgery. The final retinal surgery reattachment rate was 100%.

Best Corrected Visual Acuity Before and After Surgery

In this study, the postoperative visual acuity of 76 patients (72.4%) was better than or equal to their preoperative visual acuity. There were 32 cases with BCVA (LogMAR) less than 1.6, 44 cases were between 1.6-1.0, 24 cases were between 1.0-0.5, and 5 cases were 0.5 or better. Statistical analysis showed that the optimal corrected visual acuity after surgery was 1.28 ± 0.86 , which was not significantly different from the BCVA before surgery (1.39 ± 0.48) ($P > 0.05$). Among the 105 patients, 7 received scleral buckling surgery, and 98

received vitrectomy. The postoperatively BCVA of the buckling group was 1.10 ± 0.44 , which was not statistically significantly different from that of the vitrectomy group (1.17 ± 0.42) ($P > 0.05$).

DISCUSSION

Retinal tears and retinal vascular rupture are among the important causes of spontaneous vitreous haemorrhage^[5-7]. Posterior vitreous detachment is the main cause of retinal tears and the subsequent rupture of blood vessels. Studies have reported that in patients with posterior vitreous detachment accompanied by vitreous haemorrhage, the incidence rate of retinal tear is as high as 70%^[8-9]. A large number of clinical and basic studies have confirmed that PVD not only affects the different stages of RRD formation but also has an important relationship with the occurrence and development of PVR. When posterior vitreous detachment occurs, the rotation tension generated by the eyeball is greater on the temporal side than on the nasal side, and coupled with gravity, this tension leads to the formation of retinal tears in the temporal and superotemporal areas, especially above the superotemporal area. The results of this study are consistent with the above principles. Seelenfreund *et al*^[10] observed that all patients with rhegmatogenous vitreous haemorrhage had retinal tears located in the equator or the anterior of the equator, mostly in the upper quadrant. In this study, 82 tears were located in the superotemporal area (54.3%), 28 tears were located in the superonasal area (18.5%), 27 tears were located in the inferior temporal area (17.9%), and 14 tears were located in the inferior nasal area (9.3%), which was similar to the previous report.

In this study, there was no statistically significant difference in the BCVA before and after the surgery. Seventy-six patients (72.4%) had postoperative visual acuity that was better than or equal to their preoperative visual acuity. However, there were still some patients with retinal anatomical reattachment who had poor visual prognosis. The analysis shows that poor postoperative visual prognosis may be caused by hypoxia and necrosis of retinal nerve cells after retinal detachment, which leads to poor recovery of retinal function. In this study, patients with RRD involving the macular area had poor postoperative vision, with an average postoperative visual acuity of 1.2 LogMAR. Studies have shown that compared to patients with RRD alone, those with retinal detachment involving the macular area have more difficulty obtaining good visual acuity due to the anatomical and physiological characteristics of the macular area. The rate of anatomical reattachment in patients with RRD involving the macular area is often lower than that for patients with RRD without macular involvement^[11-14]. Moreover, there are long-term problems, such as abnormal colour vision and deformed vision, and the visual prognosis is poor^[15-17]. Because the blood-retinal barrier of patients with rhegmatogenous vitreous haemorrhage is damaged, if the vitreous blood is not absorbed for more than 2wk, PVR is prone to occur. Studies have shown that early vitrectomy to treat massive vitreous

haemorrhage has a positive effect on maintaining and improving visual function, preventing or reducing traction-related retinal detachment. At present, most studies suggest that the occurrence of vitreous haemorrhage is age-related. The average age reported for non-traumatic vitreous haemorrhage was 61.39 years^[18-19]. The average age of the patients in this study was 55.57±10.79 years. In our opinion, with ageing, vitreoretinal degeneration may worsen, which weakens the adhesion between the neurosensory retina and pigment epithelium, thereby increasing the risk of retinal tears and retinal detachment. However, there was no significant difference in the male-to-female ratio or the ratio of left to right eyes.

Based on the current research results and our data, we believe that if patients had preoperative BCVA less than 1.6 and light perception less than 1 m, they would have a poor outcome. Macular involvement combined with PVR may be a relevant factor affecting the prognosis of rhegmatogenous vitreous haemorrhage. Postoperation persistence of high intraocular pressure which could not be controlled by medicine or cataract exacerbation was associated with a poor visual outcome. But we have not encountered these conditions during the follow-up period.

At present, surgery is the only method for treating RRD. Scleral buckling and vitreous body surgery are widely used in the treatment of RRD. Scleral buckling has the advantages of reduced intraocular interference, faster recovery, and fewer complications. It has been reported that the success rate of scleral buckling is approximately 90% - 95%^[20]. In this study, we used scleral buckling to treat 7 patients, of whom 2 had retinal reattachment after the second buckling adjustment, and the final reattachment rate was 100%. This suggests that for some cases with less bleeding, no PVR, and relatively limited detachment, scleral buckling can be the first choice. In this study, there was no difference in visual acuity improvement between the buckling group and the vitrectomy group in 40 eyes without retinal detachment.

In summary, a comprehensive understanding of the clinical characteristics of rhegmatogenous vitreous haemorrhage is conducive to the early detection of tears and the avoidance of serious complications. Involvement of the macular area, the presence of retinal detachment, proliferative vitreoretinopathy, the progress of the disease, and the age of the patient all affect the patient's visual prognosis.

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