

Pars plana vitrectomy relieves the depression in patients with symptomatic vitreous floaters

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Abstract

• **AIM:** To investigate the depressive state among the patients with symptomatic vitreous floaters (SVF), as well as its change after SVF removal via vitrectomy surgery.

• **METHODS:** Twenty-eight eyes of 28 patients who underwent 27-gauge pars plana vitrectomy (PPV) for SVF were included. Thirty-nine eyes of 39 age- and gender-matched healthy volunteers without SVF were also recruited as a healthy control. Center for Epidemiologic Studies Depression (CES-D) was used to assess volunteers and patients' depression (before and 1wk after PPV).

• **RESULTS:** The CES-D score was 18.3 ± 8.6 for patients, and was 12.4 ± 6.0 for healthy control ($P=0.003$). Patients were significantly more likely to be in a depressive state (53.6%, defined as CES-D score ≥ 16) than the healthy control (20.5%, $P=0.005$). For patients with SVF, the CES-D score was negatively correlated with their age ($r_s = -0.42$, $P=0.025$). After PPV, both the CES-D score (11.9 ± 5.4 vs 18.3 ± 8.6 , $P < 0.001$) and proportion of depressive state (18.5% vs 53.6%, $P=0.005$) were significantly decreased.

• **CONCLUSION:** This study suggests that symptoms of vitreous floaters have an apparently negative impact on patients' psychological state. The PPV can effectively relieve the depressive state for patients with SVF.

• **KEYWORDS:** depression; symptomatic vitreous floaters; pars plana vitrectomy; CES-D

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INTRODUCTION

Visible floaters is a common symptom in ophthalmic patients. It was reported that 76% of the respondents among young and middle-aged (29.5 ± 10.7 y) people, acknowledged seeing floaters^[1]. Floaters typically occurs as a result of degenerative changes in the vitreous structure that occurs, largely as a result of the normal aging process^[2-4]. Vitreous syneresis, condensation of vitreous fibers, and posterior vitreous detachment that capable of scattering light entering the eye and hence symptomatic vitreous floaters (SVF) occurs^[5].

Patients with SVF often suffer spots, shadows, and other varied shapes that seem to move about in the field of vision^[6]. Up to 33% of these patients reported that the floaters caused noticeable vision impairment^[1]. Over two thirds of them had disabilities of reading and night driving^[7]. The ophthalmic practitioners usually advised patients to adapt to tenacious floaters consciously, when seeking medical help. However, unfortunately, the floaters will sometimes increase with age actually, other than disappear spontaneously. Although most of the patients grow accustomed to the visual disturbance associated with Weiss rings and other floaters, the rest (especially near-field workers) will find them to be an everlasting bother^[8].

Depression is a chronic and recurrent illness. Previous research showed that people who possess visual impairment are at a higher risk of developing depression^[9-10]. Other studies showed that depression was associated with various eyes diseases, such as cataract, glaucoma, or age-related macular degeneration^[11-13]. For the young and middle-aged population with prolonged near work, symptoms of floaters will last for several decades, making them highly vulnerable to different degrees of depression. A clinical survey showed that patients with SVF were even willing to risk a 7% chance of blindness and 11% risk of death to get rid of the floaters^[14].

Physiological floaters will not cause any organic impairment to the eye, however, it may have a severe impact on patients' mental health which outweigh the effect on visual quality. Therefore, it is of great clinical and social value to understand

the patients' mental status with SVF and to assess if their mental status improved after the removal of the floaters.

Although studies suggested that visual impairment are at higher risk of developing depression^[9-10,15], few studies assess the depressive state among patients with SVF. In this study, we aimed to investigate the depressive state among patients with SVF, as well as the change of depressive state after floaters removal through pars plana vitrectomy (PPV), which has been considered as a safe and effective treatment for floaters at present^[16].

SUBJECTS AND METHODS

Ethical Approval This study adhered to the Declaration of Helsinki, and the study protocol was approved by the Ethics Committee of The Eye Hospital of Wenzhou Medical University. Informed consent was obtained from participants prior to participation.

Subjects A cross-sectional control study was conducted in the Eye Hospital of Wenzhou Medical University, from Mar, 2017 to December, 2017. Twenty-eight eyes of 28 patients (24 males, 85.7%) who underwent 27-gauge PPV for SVF were included. The inclusion criteria for these patients were: 1) age >18y; 2) subjective sensation of the "floaters" which disturbed his/her life moderately or severely for more than 3mo; 3) clinical examination showed the vitreous opacity crumb; 4) patients who are willing to participate in this study. Patients with previous vitrectomy surgery, history of ocular trauma or mental retardation, dementia or other systemic diseases that could not communicate were excluded. Ophthalmologic examinations, including a slit lamp evaluation, best-corrected visual acuity (BCVA), intraocular pressure (IOP), vitreous and fundus examination, were performed for patients preoperatively, 1d and 1wk postoperatively.

Thirty-nine right eyes of 39 age- and gender-matched healthy volunteers (33 males, 84.6%) without SVF, any ocular, genetic, or systemic disease and without previous ocular surgery were recruited as a healthy control. The ophthalmologic examinations were also performed for the healthy volunteers.

Surgery Procedure Before PPV, pupillary dilatation was obtained with 1% tropicamide. Retrobulbar anesthesia (mixture of 2% lidocaine and 0.75% bupivacaine) or topical anesthesia (proparacaine hydrochloride) was performed according to patients' wish. To begin the surgery, three transconjunctival sutureless 27-gauge cannulae (Constellation; Alcon Laboratories Inc, Fort Worth, TX, USA) were made 4 mm posterior to the limbus with angled incision. Central vitreous followed by peripheral vitreous was removed with the help of non-contact wide-angle viewing system. At the end of the surgery, cannulae were removed and none of the eyes required suturing^[17]. All the PPV were performed by the same surgeon (Wu RH).

Evaluation of Depressive State Participants' depression was assessed with the Center for Epidemiologic Studies Depression (CES-D). CES-D consists of 20 questions addressing six symptoms of depression including depressed mood, worthlessness or guilt, helplessness or hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance experienced over the last one weeks. Each question was scored on a scale of 0-3 according to the frequency of the symptoms [never (0), sometimes (1), frequently (2) and always (3)], and the total CES-D score ranged from 0 to 60. Depressive state was defined as a sum CES-D score of ≥ 16 ^[18]. The reliability and validity of the Chinese edition of the CES-D has been previously reported^[19-20] and extensively used in Chinese population^[21-22]. The CES-D score of patients was evaluated both before and 1wk after PPV, while it was evaluated only once for the healthy control.

Statistical Analysis In this study, analyses were conducted using Statistical Analysis System for Windows version 9.1.3 (SAS Inc., Cary, NC, USA). Independent *t*-test and paired *t*-test was respectively performed to compare the differences of the CES-D score between patients with SVF and healthy control, and the operative changes of CES-D score in the patients. Chi-square tests were performed for the proportion of depressive state between the patients and healthy control, and operative changes for the patients. Spearman correlations were performed between CES-D score and its potential risk factors. A *P* value of <0.05 was considered significant.

RESULTS

The mean age of the patients and healthy control was 31.6 ± 8.9 y (range 19-48y) and 29.2 ± 2.3 y (range 26-36y), respectively. For these 28 eyes of patients who underwent 27-gauge PPV, no lens injury, vitreous/retinal hemorrhage, and iatrogenic retinal breaks occurred during operation. The median (quartile range) of the duration of the symptomatic floaters was 36mo (15-120mo) for the patients. The characteristics of the patients and healthy control were presented in Table 1. There was no significant difference for age or gender between the two groups.

The CES-D score was 18.3 ± 8.6 (range 7-37) for patients, which was significantly larger than the healthy control (12.4 ± 6.0 , range 3-35, $P=0.003$). Furthermore, 53.6% of the patients had depressive state, which was also significantly higher than the healthy control (20.5%, $P=0.005$). For patients with SVF, the CES-D score was negatively correlated with their age ($r_s=-0.42$, $P=0.025$, Figure 1), but not correlated with the symptom duration ($r_s=-0.08$, $P=0.68$). There was no significant correlation between CES-D score and age ($r_s=-0.03$, $P=0.88$) in the healthy control.

After PPV, 75% of the patients had a decreasing CES-D score (range 1-27). Furthermore, both the overall CES-D score

Table 1 The characteristics of patients with SVF and healthy control

Parameters	Patients with SVF (n=28)	Healthy control (n=39)	P
Age (y)	31.6±8.9	29.2±2.3	0.17
Male (n, %)	24 (85.7)	33 (84.6)	0.91
BCVA (Snellen)	0.96±0.16	0.95±0.20	0.83
IOP (mm Hg)	15.8±4.1	13.0±6.1	0.32
Score of CES-D	18.3±8.6	12.4±6.0	0.003
Proportion of depressive state (n, %)	15 (53.6)	8 (20.5)	0.005

BCVA: Best-corrected visual acuity; CES-D: Center for Epidemiologic Studies Depression; SVF: Symptomatic vitreous floaters. Depressive state was defined as CES-D score ≥16.

Table 2 The difference of depression characteristics of symptomatic floaters patients before and after PPV

Parameters	Before PPV (n=28)	After PPV (n=28)	P
BCVA (Snellen)	0.96±0.16	0.97±0.09	0.53
IOP (mm Hg)	15.8±4.1	14.0±4.6	0.048
Score of CES-D	18.3±8.6	11.9±5.4	<0.001
Proportion of depressive state (n, %)	15 (53.6)	5 (18.5)	0.005

BCVA: Best-corrected visual acuity; CES-D: Center for Epidemiologic Studies Depression; PPV: Pars plana vitrectomy.

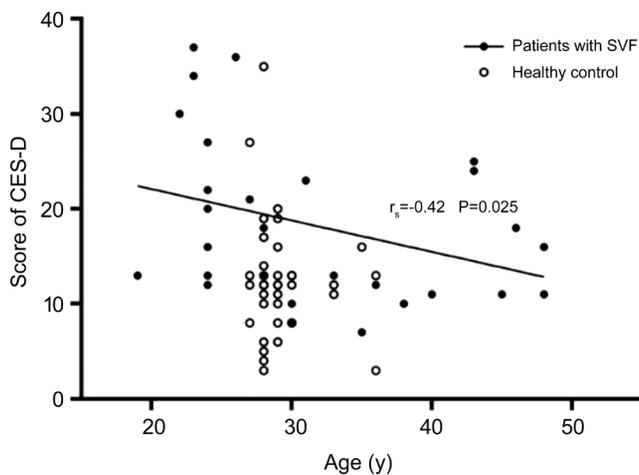


Figure 1 Scatter plot of the association between the score of CES-D and age of all participants.

(11.9±5.4 vs 18.3±8.6, $P<0.001$) and proportion of depressive state (18.5% vs 53.6%, $P=0.005$) were significantly decreased (Table 2).

DISCUSSION

Previous study has shown that vitreous floaters have impact on vision by markedly lowering contrast sensitivity function^[23]. The 50% of the patients have trouble reading and 30% of the patients have trouble driving due to SVF^[16]. In fact, a utility analysis performed by Wagle *et al*^[14] found that symptomatic patients were even willing to risk a 7% chance of blindness and 11% risk of death to get rid of the floaters. Contrary to popular ophthalmologists’ belief, patients with floaters have been very keen to remove their floaters^[6]. Depression was significantly associated with visual impairment^[24-26]. Many studies found a high risk for depression among people who suffer from eye

disorder like age-related macular degeneration, glaucoma and diabetic retinopathy^[27-28]. Because of long time influence from the symptoms of floaters (spots, shadows, and other varied shapes that seem to move about in the field of vision), patients may be more likely to be depressed. However, to our knowledge, there is a paucity of research into the depressive state in patients with SVF. In this study, we evaluated the depressive status as well as its change after PPV for patients with SVF assessed by CES-D.

In this study, we evaluated the depressive level (CES-D score) and depressive state (CES-D score ≥16), as well as their change after PPV for patients with SVF assessed by CES-D. There were three important and interesting findings. First, both the depressive level and depressive state in patients with SVF were higher than healthy control. It should be noted that in the present study, the proportion of depressive state for patients with SVF were 2.5 times compared to the healthy control without floater symptoms (53.6% vs 20.5%), even though subjects in both groups had good and comparable visual acuity. These indicated that symptoms of floaters had an apparently negative impact on the psychological state of the patients, independent of the visual acuity. In a previous report from Kim *et al*^[29], where they compared the depressive state between 61 patients with SVF and 34 controls without SVF using Patient Health Questionnaire-9. They also found that the patients had significantly higher depression score than the controls (6.5±6.3 vs 2.3±2.3, $P<0.001$).

Second, a significant remission of both depressive level and depressive state was found for patients with SVF after PPV, which was also independent of the visual acuity. At present, small gauge vitrectomy surgery was reported to be safe and

effective for relieving symptoms of floaters^[6-7,30]. For example, Mason *et al*^[16] reported that the postoperative visual acuity or visual function had increase for patients with SVF undergoing 25-gauge PPV. Other studies have also come to similar conclusions that vitrectomy can improve visual function and quality-of-life in patients with SVF^[6-7]. Our previous study reported that over 90% of the patients with SVF felt the symptoms were resolved after 27-gauge PPV and were satisfied with the surgical outcome. For these patients, no lens injury, iatrogenic retinal break or detachment, and vitreous/retinal hemorrhage occurred during operation. Postoperative complications occurred in two eyes: one (2.1%) had endophthalmitis and one (2.1%) had retinal detachment. No clinical significant cataract was observed in the postoperative phakic eyes^[30]. However, to our knowledge, this is the first study to directly assess the psychological state of the patients with SVF after PPV.

Third, a significant negative correlation was found between the age and CES-D score among patients with SVF, *i.e.*, younger patients had higher level of depression. This may due to a higher demand of good visual quality for younger patients who typically spend longer periods reading, driving, working with digital products, or doing other close work. Hence, it is understandable that younger patients with SVF were more likely to be depressed.

Limitations of this study included a relatively small sample of patients and a short follow-up time. Furthermore, the relationship between depression and detailed characteristics of vitreous floaters (such as the size and location) was not examined in this study. Further studies with larger samples, more comprehensive evaluations and a longer follow-up time are warranted.

In conclusion, symptoms of vitreous floaters have an apparently negative impact on the patients' psychological state, independent of the visual acuity, and removal of the floaters *via* vitrectomy can effectively relieve the depression associated with SVF.

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