Epidemiology, Clinical Characteristics, and Visual Outcomes of Patients with Intraocular Foreign Bodies in Southwest China: A 10-Year Review

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Keywords

Intraocular foreign bodies · Southwest China · Epidemiology

Abstract

Introduction: Intraocular foreign bodies (IOFBs) are a serious subset of open-globe injury that can result in visual loss. This study analyzed the epidemiology, clinical characteristics, and visual outcomes of patients with IOFBs in Southwest China. **Methods:** This retrospective study comprised 1,176 patients with the primary diagnosis of IOFBs who resided in Sichuan Province over a 10-year period. All data were collected from medical records and analyzed statistically. **Results:** The annual incidence for IOFBs was 0.14 per 100,000 (95% confidence interval 0.12–0.16 per 100,000) people in Southwest China. In that period, IOFBs accounted for 22.3% of all open-globe injuries. Working-age male patients accounted for 79.1% of all IOFBs patients and there had significant differences in age distributions between genders ($p < 0.001$). Metallic IOFBs were the most common (74.6%) IOFB, but there were significant differences in the materials of IOFBs between adults and children of different age-groups ($p < 0.001$). At discharge, 277 (23.6%) patients had increased

visual acuity (VA) and 95 (8.0%) had no light perception. Initial VA $< 20/200$ (odds ratio [OR], 5.5; $p < 0.001$), increasing wound size (OR, 1.3; $p = 0.004$), IOFBs in the posterior segment (OR, 2.6; $p = 0.002$) and existing complications (traumatic cataract, endophthalmitis, retinal detachment, or retinal break) were independent risk factors for final VA $< 20/200$.

Conclusion: The incidence of IOFBs in Southwest China differed from global statistics. Adults and children had different clinical characteristics. Thus, their prevention strategies should be different.

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Introduction

Intraocular foreign bodies (IOFBs) account for 18–41% of all open-globe injuries so are a substantial public health problem worldwide [1, 2]. IOFBs may result in a wide range of intraocular pathologies [3]. In 2008, the UK reported the current incidence and clinical characteristics of IOFBs and China reported that in 2011 [4]. However,

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Fig. 1. Extraction methods and final number of records of patients with ocular trauma at the West China Hospital, Chengdu, Sichuan Province, between 2009 and 2018. Patients were grouped according to the type of eye injuries (based on the Birmingham Eye Trauma Terminology System [12]), injury history, and address. IOFB, intraocular foreign body.

the clinical characteristics in different districts might be heterogenous. From the whole point of view, IOFBs accounted for 28.6% of all open-globe injuries in China [4]. But in Hubei Province, which located in south central China, IOFBs accounted for 16.2% [5]. And in Hong Kong, IOFBs accounted for 16% [6]. Of note, epidemiologic data of IOFBs in Southwest China are still unrevealed.

Besides, there were several studies describing the clinical characteristics of ocular trauma in specific popula-

tion such as children [7, 8], working-age adults [9], and elderly people [10]. However, only few studies reported the clinical characteristics of IOFBs in children [11], and no study focused on the differences of clinical characteristics between adults and children. Thus, this study aimed to analyze epidemiology, clinical characteristics, and visual outcomes in patients with IOFBs in Sichuan Province, which located in Southwest China, and determine whether there were differences of characteristics among adults and children in different age-group.

Table 1. Demographics of patients hospitalized for IOFBs

Total patients	1,176 ^a
Gender, <i>n</i> (%)	
Male	1,099 (93.5)
Female	77 (6.5)
Marriage status, <i>n</i> (%)	
Single	181 (15.4)
Married	914 (77.7)
Child and teenager	78 (6.6)
Unknown	3 (0.3)
Level of education, <i>n</i> (%)	
Illiteracy	54 (4.6)
Literate, completed primary education	384 (32.7)
Literate, completed secondary education	497 (42.3)
Literate, completed higher secondary education	91 (7.7)
Literate, completed college/polytechnic	55 (4.7)
Toddler/preschooler	24 (2.0)
Grade schooler/adolescent	69 (5.8)
Unknown	2 (0.2)
Occupation, <i>n</i> (%)	
Worker	480 (40.8)
Farmer	443 (37.7)
Business/teacher	38 (3.2)
Student	61 (5.2)
Toddler/preschooler	24 (2.0)
Other	39 (3.3)
Not working	91 (7.8)
Location, <i>n</i> (%)	
Urban	349 (29.7)
Rural	827 (70.3)
Cause of injury, <i>n</i> (%)	
Work	926 (78.7)
Daily life	143 (12.2)
Accident	33 (2.8)
Assault	1 (0.1)
Firecracker or firework	35 (3.0)
Other	38 (3.2)

^a A total of 1,176 patients were identified in our study.

Materials and Methods

This study population was composed of all patients with the primary diagnosis of IOFB who were admitted to the Department of Ophthalmology in the West China Hospital, Chengdu, Sichuan Province, between 1 January 2009 and 31 December 2018. West China Hospital is the largest tertiary hospital in Sichuan Province, which located in Southwest China, handling almost all IOFB cases in this region. Only patients who resided in Sichuan Province were included, while patients from other provinces were excluded. Detailed screening progress is listed in Figure 1. This study was performed in line with the principles of the Declaration of Helsinki and approved by the Ethics Committee of West China Hospital. All data were anonymous and retrospectively collected. The requirement of written informed consent was, therefore, waived.

All cases of IOFBs were diagnosed according to the Birmingham Eye Trauma Terminology System [12, 13]. A diagnosis of IOFB indicates any open-globe injury with a retained foreign object, which must be observed in ophthalmologic or imaging examination or in surgery.

The medical record system of our hospital was the source for all patient data. According to the laws of China, we classified patients ≥ 18 years old as adults and patients < 18 years old as children. Based on their age and study status, we divided the children into 3 groups: preschool children (0–6 years old), primary school children (7–12 years old), and secondary school children or adolescents (13–17 years old). Visual acuity (VA) was the best-corrected or pinhole VA and was converted from decimal VA to Snellen VA ratios [14, 15]. The largest IOFB was recorded if there were multiple IOFBs in an eye. The location of the wound was divided into 3 zones according to the Ocular Trauma Classification Group: Zone I included an opening limited to the cornea, Zone II included a wound involving the anterior 5 mm of the sclera, and Zone III included injuries > 5 mm posterior to the corneoscleral [16].

Diagnosis of endophthalmitis was made based on clinical symptoms and signs before and during the surgery. The culture outcomes were not considered in the diagnosis of endophthalmitis because culturing of intraocular contents was performed in only some of the cases and the rate of positive cultures was low, even in some cases with obvious symptoms.

All data were collected into an electronic database and were cross-checked for errors. Data in this report are presented as mean $\pm$ standard deviation for continuous variables and as frequency or percentage for categorical variables. Continuous variables were evaluated for normality, and means were compared using a 2-tailed *t* test. Categorical variables were analyzed using a χ^2 test. Univariate and multivariate analyses were conducted to determine the independent factors affecting visual outcome after the occurrence of an IOFB. All statistical analyses were performed using statistical software packages R (<http://www.R-project.org>, The R Foundation, Vienna, Austria) and EmpowerStats (<http://www.empowerstats.com>, X & Y Solutions, Inc., Boston, MA, USA). A *p* value of < 0.05 was considered statistically significant for all tests.

Results

Demographics

The demographic characteristics are shown in Table 1. A total of 1,176 patients with IOFBs were included, accounting for 22.3% of all open-globe injuries. The mean annual incidence of hospitalization for IOFBs was estimated to be 0.14 per 100,000 (95% confidence interval [CI] 0.12–0.16 per 100,000) people in Sichuan Province, which is located in Southwest China and is regarded as representative of this region. Figure 2 shows the detailed incidence of IOFB for each year among this 10-year period.

Among these patients, 1,099 (93.5%) were males and 77 (6.5%) were females, yielding a male-to-female ratio of 14.3:1. The mean ($\pm$ standard deviation) patient ages were

Table 2. Frequency of IOFBs by sex and age-groups

Age-group	Male, n (%)	Female, n (%)	Male-to-female ratio	p value
1–10	39 (3.5)	13 (16.9)	3:1	<0.001
11–20	78 (7.1)	6 (7.8)	13:1	
21–30	172 (15.7)	3 (3.9)	57.3:1	
31–40	239 (21.7)	16 (20.8)	14.9:1	
41–50	337 (30.7)	25 (32.5)	13.5:1	
51–60	182 (16.6)	8 (10.4)	22.8:1	
61–70	47 (4.3)	5 (6.5)	9.4:1	
70–80	4 (0.4)	1 (1.3)	4:1	
80–90	1 (0.1)	0 (0.0)	–	

Table 3. Characteristics of wound and foreign bodies

Variable	Characteristics
Wound, n (%)	
Zone	
I	984 (83.2)
II	111 (9.4)
III	72 (6.1)
Unknown	16 (1.3)
Type	
Penetration	1,050 (88.8)
Perforation	33 (2.8)
Rupture	34 (2.9)
Unknown	66 (5.6)
Size, mm	3.8±3.1
Foreign bodies, n (%)	
Number	
1	1,073 (94.1)
2	34 (3.0)
3	12 (1.1)
>3	19 (1.6)
Unknown	45 (3.8)
Location	
Cornea	64 (5.5)
Anterior chamber	105 (9.0)
Sclera	51 (4.4)
Lens	99 (8.5)
Vitreous	324 (27.7)
Retina	515 (44.1)
Unknown	11 (0.9)
Size, mm	6.1±6.2

39.2 ± 14.0 years for males and 36.2 ± 18.4 years for females ($p = 0.38$). The largest number of injuries occurred among patients aged 40–50 years old, but there were significant differences in sex ratio between different age-groups ($p < 0.001$) (Table 2). The male-to-female ratio of preschool children (ages 0–6) is 2.4:1, while that of ado-

Fig. 2. The annual incidence of IOFB in Sichuan Province, South-west China. IOFB, intraocular foreign body.

lescents is 26:1. The most common occupation was worker (40.8%, $n = 480$), followed by farmer (37.7%, $n = 443$), in addition, 86.5% adults with ≤9 years of education (with primary and/or secondary education).

The delay in presentation of the patients, that is, between injury and arrival at the hospital, ranged from 1 h to 40 years. Just over half (50.3%) of the patients presented within 24 h and 77.6% presented within 3 days. However, 2.0% presented more than 1 year after the trauma. The delay in presentation was not significantly associated with age, level of education, marital status, or occupation but was associated with the presentation of some complications. Patients with endophthalmitis were more likely to present within 1 month (odds ratio [OR] 15.9, 95% CI 3.9–64.9, $p < 0.001$) than those who sought treatment after 1 month. Patients with secondary glaucoma were more likely to present after more than 1 year (OR 12.4, 95% CI 4.3–35.9, $p < 0.001$). The median length of hospital stay was 6.3 ± 2.9 days.

Causes, Timing, and Characteristics of Wounds

As shown in Table 1, the most common cause of IOFBs was work-related injury ($n = 926$, 78.7%), followed by life-related events ($n = 143$, 12.2%) such as cooking, playing or cutting firewood, accidents such as traffic accidents or being hurt by falling/flying objects ($n = 33$, 2.8%), firecrackers or fireworks ($n = 345$, 3.0%), and assaults ($n = 1$, 0.1%). Among the patients with a known mechanism of injury, the most common was

Table 4. Material of IOFBs among adults and children of different age-groups

Material of IOFBs	Age-group				<i>p</i> value
	0–6, <i>n</i> (%)	7–12, <i>n</i> (%)	13–17, <i>n</i> (%)	≥18, <i>n</i> (%)	
Metallic	5 (20.8)	6 (14.3)	19 (70.4)	846 (78.0)	<0.001
Stone	4 (16.7)	15 (35.7)	2 (7.4)	113 (10.4)	
Glass	2 (8.3)	7 (16.7)	4 (14.8)	48 (4.4)	
Plant	3 (12.5)	4 (9.5)	0 (0.0)	24 (2.2)	
Animal	2 (8.3)	1 (2.4)	0 (0.0)	6 (0.6)	
Eyelash	1 (4.2)	1 (2.4)	0 (0.0)	18 (1.7)	
Pencil	5 (20.8)	7 (16.7)	0 (0.0)	0 (0.0)	
Other	2 (8.3)	1 (2.4)	2 (7.4)	29 (2.7)	

IOFBs, intraocular foreign body.

hammering metal ($n = 536$, 45.8%). Cutting was the second-most common mechanism of injury, accounting for 8.8%. The majority of injuries occurred during spring ($n = 298$, 26.0%) and autumn ($n = 313$, 27.2%), but March ($n = 113$, 9.6%) and December ($n = 113$, 9.6%) were the individual months with the highest number of patients. February had the lowest number ($n = 69$, 5.9%). However, the occurrence of firecracker- or fireworks-associated IOFBs in January and February was higher than in all other months, yielding a ratio of 1.7:1. It should be noted that the number of IOFBs caused by fireworks or firecrackers was 3.9 per year before 2016 and 2.7 per year after 2016.

Among these IOFB cases, 1,165 (99.1%) patients were monocular IOFBs (586 right eyes were involved and 579 left eyes were involved), while 11 (0.9%) patients suffered from bilateral IOFBs. In particular, there were 20 patients who suffered from bilateral injuries but not all of them had bilateral IOFBs. All bilateral injuries were caused by an explosion. Penetration was the most common injury ($n = 1,050$, 88.8%), and 984 injuries were in zone I (Table 3).

Characteristics of Foreign Bodies and Ocular Findings

The characteristics of the IOFBs are shown in Table 3. The objects ranged from 1 to 35 mm in diameter, with great variety in shapes and sizes. It was most common for the IOFBs in adults to be metal ($n = 846$, 78.0%), followed by stone ($n = 113$, 10.4%). For children <7 years old, pencils ($n = 5$, 20.8%) and metal ($n = 5$, 20.8%) were the most frequent IOFBs. For children age 7–12, stones ($n = 15$, 35.7%) were the most frequent IOFBs, and for adolescents, metal ($n = 19$, 70.4%) was the most frequent IOFB (Table 4).

Table 5. Ocular findings in eyes with IOFBs

Findings	Patients, <i>n</i> (%)
Traumatic cataract	917 (78.4)
Vitreous hemorrhage	547 (46.8)
Breach of lens capsule	396 (33.9)
Retinal lesions	361 (30.9)
Endophthalmitis	305 (26.1)
Retinal breaks	297 (25.4)
Hypopyon	187 (16.0)
Hyphema	182 (15.6)
Retinal detachment	162 (13.9)
Iridodialysis	108 (9.2)
Retinal dialysis	35 (3.0)
Len subluxation	33 (2.8)
Siderosis	32 (2.7)
Secondary glaucoma	28 (2.4)
Choroid detachment	26 (2.2)
Orbital cellulitis	18 (1.5)
Cyclodialysis	7 (0.6)

Most of the IOFBs were located in the posterior segment ($n = 849$, 71.8%), with 521 (61.4%) on the retina and 328 (38.6%) in the vitreous. Of the anterior-segment IOFBs, the anterior chamber was the most common location, accounting for 32.5%.

The ocular findings are shown in Table 5. Traumatic cataract ($n = 931$, 78.7%) was the most frequent ocular finding, followed by vitreous hemorrhage ($n = 556$, 47.1%). Endophthalmitis was diagnosed in 197 (16.7%) eyes. Compared with patients with anterior-segment IOFBs, the prevalence of retinal breaks or retinal detachment among patients with posterior-segment IOFBs was 5.8 times higher ($p < 0.001$).

Table 6. Initial VA, discharge VA and OTS of eyes with IOFBs

	Eyes, <i>n</i> (%)
Initial VA	
≥20/40	107 (9.0)
20/200–20/40	159 (13.5)
1/200–20/200	185 (15.6)
HM/LP	659 (55.7)
NLP	55 (4.7)
Unknown	18 (1.5)
Discharge VA	
≥20/40	69 (5.8)
20/200–20/40	114 (9.6)
1/200–20/200	334 (28.2)
HM/LP	536 (45.3)
NLP	95 (8.0)
Unknown	35 (3.0)
OTS	
0–44	407 (35.4)
45–65	436 (37.9)
66–80	225 (19.5)
81–91	61 (5.3)
92–100	22 (1.9)

VA, visual acuity; OTS, ocular trauma score; HM, hand move; LP, light perception; NLP, no light perception.

Initial Visual Acuity, Visual Outcome, and Prognostic Factors Influencing Discharge Visual Acuity

Initial VA was better than or equal to 20/200 in 266 (22.5%) patients. The VA group with the highest percentage of patients was the group with light perception/hand movement group (55.7%). The Ocular Trauma Score (OTS) classification (Table 6) assesses the extent of the eye injury and evaluates the prognosis.

Among these patients, 98.6% agreed to surgical treatment while 1.4% refused for economic or other reasons. Of the 1,148 eyes with VA measured at discharge, 277 had increased VA of 1 or more Snellen lines, 252 had decreased VA, and 619 had no change in VA. Long-term follow-up was needed for 37.9% of patients, and 56.3% of patients needed further surgery. Permanent vision loss was reported in 5.8% of patients. Univariate and multivariate analyses of the prognostic factors influencing discharge VA are presented in Table 7. Initial VA <20/200 (OR, 5.5; $p < 0.001$), wound size (OR, 1.3; $p = 0.004$), IOFB in the posterior segment (OR, 2.6; $p = 0.002$), and the presence of traumatic cataract (OR, 2.2; $p = 0.034$), endophthalmitis (OR, 2.7; $p = 0.006$), retinal detachment (OR, 3.6; $p = 0.041$), or retinal breaks (OR, 2.4; $p = 0.027$) were the independent risk factors for discharge VA worse than 20/200.

Discussion

IOFBs are problems worldwide and represent a serious form of open-globe injuries that can result in visual loss [4]. The annual incidence rate of IOFBs in our study differed from that of a study in the UK (0.16 per 100,000) [17]. Our study also showed a higher rate of IOFBs among all open-globe injuries than rates reported in south central China (16.2%) [5] and Hong Kong (16%) [6]. Differences in lifestyle, education level, income level, and government policies in different regions and countries may account for the different results across studies.

Among adults, the majority of IOFBs occurred in working-age males, consistent with most other studies [4, 5, 18, 19]. Workers and farmers were the 2 most common occupations among the injured because they are more likely to have opportunities for hammering, drilling, chiseling, or shoveling, which are activities with a high risk of causing splatter of foreign bodies. And males represent the majority of laborers in China so are more prone to injuries [5]. In addition, there were a small number of patients who were hurt while watching others work. Therefore, eye protection should be enhanced for people at work, to avoid the occurrence of IOFBs. Furthermore, for patients who were injured in a traffic accident or were hurt by falling objects, we recommend increasing vigilance when in dangerous situations. In this study, patients with IOFBs were likely to have ≤9 years of education, which may be related to the gradual implementation of 9-year compulsory education in China during this period (<http://www.npc.gov.cn/npc/c30834/201901/21b0be5b97e54c5088bfff17903853a0d.shtml>).

For children, consistent with other studies [7, 8, 20, 21], we found that boys were more likely to be injured. There were significant differences in sex ratio of boys and girls in different age-groups because of personality and social characteristic diversity. Preschool children (<7 years old), both boys and girls, lack the ability to identify risks. Thus, the protection of preschool children by parents should be increased, to reduce the incidence of IOFBs. Children in primary school (7–12 years old) have more opportunities to play with others, increasing the incidence of injury caused by others. Furthermore, the differences in hobbies between boys and girls become more obvious at this stage, with boys taking part in outdoor activities or competitive games more than girls [20, 22, 23]. Thus, the recommendations are increasing safety education, enhancing children's safety awareness and avoiding dangerous behaviors that may cause injury. Adolescents (13–17 years old) showed characteristics of both

Table 7. Univariate and multivariate analysis of independent risk factors for discharge VA <20/200 in eyes with IOFBs

Variables	Univariate analysis		Multivariate analysis	
	OR (95% CI)	<i>p</i> value	OR (95% CI)	<i>p</i> value
Wound size, mm	1.4 (1.3, 1.6)	<0.001	1.3 (1.1, 1.5)	0.004
Wound in zone I	1.0 (0.6, 1.5)	0.839	0.8 (0.3, 1.9)	0.606
IOFBs in posterior segment	5.4 (3.9, 7.5)	<0.001	2.6 (1.4, 4.8)	0.002
IOFBs size, mm	1.0 (1.0, 1.1)	0.035	1.0 (0.9, 1.0)	0.643
Initial VA <20/200	12.7 (8.8, 18.1)	<0.001	5.5 (2.9, 10.5)	<0.001
Traumatic cataract	2.6 (1.9, 3.7)	<0.001	2.2 (1.1, 4.6)	0.034
Retinal detachment	8.4 (3.1, 22.9)	<0.001	3.6 (1.1, 12.2)	0.041
Endophthalmitis	2.2 (1.3, 3.7)	0.003	2.7 (1.3, 5.6)	0.006
Vitreous hemorrhage	3.1 (2.2, 4.4)	<0.001	1.1 (0.6, 2.0)	0.786
Retinal breaks	3.2 (2.0, 5.3)	<0.001	2.4 (1.1, 5.1)	0.027

IOFBs, intraocular foreign bodies; VA, visual acuity; CI, confidence interval; OR, odds ratio.

children and adults, as 59.3% of the IOFBs were work-related and 25.9% occurred in daily life. Therefore, eye protection should be improved for adolescents.

The majority of injuries occurred during spring and autumn. A possible reason was that the temperatures were more suitable for work and farming. However, late in the year, various projects that increase workloads to achieve end-year goals, which may be responsible for the high incidence of IOFBs in December. In contrast to that, February had the lowest incidence because of the Spring Festival comes and people rest at home, leading to a low incidence of IOFB. However, during this period, there was a significantly higher occurrence of firecracker- and fireworks-associated IOFBs, which is consistent with other reports [5]. Playing with fireworks or firecrackers is an important part of the celebrations for Spring Festival. The number of firecracker- or fireworks-associated IOFBs was noticeably lower after 2016 because of the publication and promotion of the “Ban on Fireworks” that year.

The delay in presentation time was not significantly associated with patient age, level of education, marital status, or occupation in our study but was associated with the presence of certain conditions. Among patients who sought treatment >1 year after injury in our study, secondary glaucoma seemed to be the leading cause according to our study.

Compared with anterior-segment IOFBs, posterior-segment IOFBs were more likely to give a worse VA, which was similar to other studies [4, 6, 24]. This was likely because IOFBs that are able to reach the posterior segment often carry more energy (to go through more tissues and reach the vitreous or retina) so can cause more

damage to the eye. We also found that the IOFBs located in the vitreous tend to be accompanied by retinal lesions or breaks. Such IOFBs reach the retina first and then ricochet, finally landing in the vitreous. It seems that this kind of IOFB has a smaller size and sharper shape, leading to less resistance and less energy dissipation when going through the eyeball and along a lengthy path.

Post-traumatic endophthalmitis is a severe but uncommon complication of open-globe injury [3]. Previous studies have reported that the presence of IOFB could increase the risk of endophthalmitis [25]. Compared to other studies [3, 6], our study showed a high frequency of endophthalmitis (16.7%). Notably, our hospital is the largest medical center in Southwest China and receives the severest IOFB cases. Also, differences in injury settings in different countries may have an impact on the frequency of endophthalmitis, especially between the developed countries and developing countries.

Patients with an IOFB usually have a poor prognosis [26]. In 2002, Kuhn et al. [27] developed the OTS criteria, which is a simplified categorical system used to assess visual prognosis for ocular trauma patients. This system has now been verified by many studies [28, 29]. In our study, about 72.1% of eyes had an initial VA grade of 1 or 2, and 72.5% of eyes had an OTS of grade 1 or 2. IOFBs can cause direct mechanical damage along their path, but they can also ricochet and cause additional intraocular damage [3]. Additionally, the foreign body may carry a large number of pathogens, or its own toxicity may cause damage to the eye [30].

We identified the initial VA, wound size, location of the IOFB, and the presence of certain complications (en-

dophthalmitis, retinal detachment, retinal breaks, or traumatic cataract) as predictive factors in patients with retained IOFBs. These findings are consistent with other studies [3, 4, 6, 18, 31].

In this study, we analyzed the epidemiology, clinical characteristics, and factors affecting the visual prognosis for patients with IOFBs in Southwest China. However, this study had several potential limitations. First, this study was a retrospective study in which all data were collected from medical records, and some records were not very detailed. However, there were only a small number of patients with missing data so that did not significantly affect the main findings of this study. Second, because the number of female patients was significantly lower than the number of male patients, small change in the female results could substantially affect the findings. However, we counteracted the effect of gender bias by using adjusted variables in stratified and multivariate analysis. Third, this study lacks long-term follow-up information on patients, so we cannot report the patients' final visual outcomes.

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Statement of Ethics

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of West China Hospital (No. 2020.47). All data are anonymous and retrospectively collected, and the requirement of written informed consent was therefore waived.

Conflict of Interest Statement

The authors indicate no competing/conflicts of interest.

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Author Contributions

The study was designed by Meixia Zhang and Tiancong Chang. Material preparation, data collection, and analysis were performed by Tiancong Chang, Yun Zhang, Ling Liu, Keren Zhang, Xinyu Zhang, Miao Wang, and Yue Zeng. The manuscript was written by Tiancong Chang and Yun Zhang, reviewed and edited by Meixia Zhang. All authors read and approved the final manuscript.

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