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VALUE OF OCULAR TRAUMA SCORE IN PREDICTING THE INCIDENCE OF RETINAL DETACHMENT AFTER CLOSED GLOBAL INJURY

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ABSTRAC

Background: One of the more serious complications of closed globe injuries is retinal detachment (RD), which frequently results in the loss of permanent vision if not treated promptly. The Ocular Trauma Score (OTS) was developed as an instrument that can be used to forecast visual outcomes in cases of ocular trauma. Its predictive efficacy on RD in particular, following closed globe injuries, however, is under-studyed.

Objectives: To determine the predictive ability of the Ocular Trauma Score (OTS) in estimating the incidence of retinal detachment in closed globe injuries, as well as the relevance of the latter in clinical decision making and improved management.

Place and duration of study: From June 2024 to November 2024 Ophthalmology Department, Combined Military Hospital Quetta.

Methodology: This Prospective observational cohort study involved 100 patients who sustained injuries to the closed globe at a tertiary referral centre in a retrospective study. Demographic data of the patients, details of injury, OTS scores, and initial visual acuity were gathered. Incidents of retinal detachment were taken, and statistical analysis was done through the chi-square test to test the relation between the categories of OTS scores and the occurrence of RD. The average age of patients was 40 years, and the standard deviation was 15 years.

Results: Among the 100 patients, the incidence of retinal detachment was 15%. Patients with an OTS score of 4 or 5 had an RD incidence of 18%, compared to only 4% in those with higher OTS scores (1–3). Statistical analysis revealed a significant correlation between lower OTS scores and higher RD risk ($p = 0.03$). Additionally, poor initial visual acuity (light perception or no light perception) was significantly associated with RD ($p = 0.02$). Factors such as vitreous hemorrhage, blunt trauma, and posterior segment involvement also increased RD risk.

Conclusion: Ocular Trauma Score is a good indicator of the retinal detachment after closed globe injuries. The more serious injuries and poor visual acuity upon presentation are reflected by lower OTS scores, which are associated with a higher incidence of RD. This knowledge may help clinicians recognise patients who are at a higher risk of retinal detachment and help intervene early.

KEYWORDS: Ocular Trauma Score, retinal detachment, closed globe injury, visual prognosis

INTRODUCTION

Retinal detachment (RD) is one of the severe ocular complications of injuries to the closed globe and frequently causes permanent damage to visual functions unless addressed in time. RD as a complication after ocular trauma is a significant contributor to visual morbidity and may have a severe effect on the quality of life of patients [1]. A good proportion of ocular trauma is due to closed globe injuries, especially as a result of blunt trauma. These traumas have very diverse visual outcomes based on the severity of injuries, areas affected, and the response time. Ocular Trauma Score (OTS) is one of the multiple prognostic instruments that can be utilised in evaluating the results of ocular trauma, and this instrument has become a significant means of predicting the ultimate visual prognosis. Such a scoring system takes into consideration several variables, such as initial visual acuity, the nature of the injury, and even the occurrence of some other related injuries and gives a score that can help determine the probability of visual recovery [2,3].Nevertheless, although the OTS has been extensively applied in determining general visual prognosis, it is yet to be clear whether the tool can be used to determine certain complications, including retinal detachment. The subject of retinal detachment after closed globe injuries has been a major challenge in the clinical setting, as it is not always evident at the first examination. Early detection of patients who are at the greatest risk of developing RD can have a considerable effect on the clinical treatment

decision, i.e. whether close monitoring or surgery is necessary [4,5]. The OTS classifies patients into five groups depending on their risk towards poor visual outcomes. Group 1 is the best prognostic group, and Group 5 consists of the worst visual prognostic group [6]. It should be remembered that a low OTS score is indicative of more severe trauma and impaired initial visual acuity, which is believed to be associated with increased risk of developing severe complications, including RD. Study has shown a correlation of low OTS scores with several ocular complications in the past, but limited studies have been conducted on the predictive efficacy of OTS for retinal detachment [7].The ability to comprehend the correlation between the OTS and the retinal detachment may be used to inform clinical judgment, such as whether it is worthwhile to resort to early surgical intervention or not or whether it is necessary to focus on monitoring the retinal condition. Through the identification of people at high risk of RD, clinicians are able to put in place timely strategies that can prevent loss of vision. Thus, the current study aims to determine the necessity of the OTS in the process of predicting retinal detachment in patients who sustained closed globe injury [8,9].The study is important because it aims to address the existing knowledge gap on the possible role of the OTS in the prediction of retinal detachment, which is a severe complication after ocular trauma. This study may be able to alter the way we follow up and treat patients with closed globe injuries, the ones that have lower OTS scores and avoid the development of poor visual outcomes [10].

Study Objectives

To determine the predictive ability of the Ocular Trauma Score (OTS) in estimating the incidence of retinal detachment in closed globe injuries, as well as the relevance of the latter in clinical decision making and improved management.

MATERIALS AND METHODS

Study Design & Setting

This Prospective observational cohort study conducted Department of Ophthalmology Combined Military Hospital, Quetta, From June 2024 to November 2024

Participants

The participants were 100 patients with closed globe injuries and were treated and diagnosed at a tertiary hospital. Evaluation of patients was done through demographic, OTS score, type of injury, and visual outcomes. The sample consisted of male and female patients of different ages. Only individuals who had a documented follow-up of not less than 3 months were considered.

Sample Size Calculation

The calculation of sample size was done on the assumption that the retinal detachment would occur in 15% of the patients, and the confidence level of 95 and the error margin of 5. A sample of 100 subjects was used to ensure that there would be sufficient statistical analysis and valid findings on the predictive value of the OTS in RD.

Inclusion Criteria

They were patients aged 18 years or older, with a recorded history of both blunt trauma and accidental injury induced closed globe injury and recorded a history of follow-up of at least three months. Only participants with full data on OTS and clinical outcomes were eligible for this study.

Exclusion Criteria

The patients who were open-globe injured, whose retinal disease had existed before or had undergone prior ocular surgery and those who did not have full clinical information were omitted. Moreover, the study was not inclusive of patients who failed to do follow-ups in at least three months or those with other concurrent severe systemic injuries.

Diagnostic and Management Strategy.

Clinical examination was used to diagnose patients: tests such as slit-lamp examination, fundus photography, and B-scan ultrasonography were performed. The level of observation, vitrectomy, or scleral buckle surgery was involved in the management, based on the extent of retinal detachment and the duration of presentation of injury.

Statistical Analysis

Patient demographics and the characteristics of injuries were summarised using descriptive statistics. Chi-square test was used to test the relationship between the categories of OTS score and prevalence of retinal detachment. p-values below 0.05 were regarded as significant. Analysis was done with the help of SPSS version 22.0, Windows version.

Ethical Approval

Ethical approval was obtained from the Research Evaluation Unit, CPSP, under Reference No. CPSP/REU/OPL-2023-002-2650, dated June 15, 2024, before commencement of the study and data collection procedures.

RESULTS

A total of 100 patients with a mean age of 40 years (SD = 15) were included in the study. The incidence of retinal detachment in the cohort was 15%. Among patients with OTS scores of 4 or 5, 18% developed RD, while only 4% of those with higher scores (1–3) developed RD. This difference was statistically significant, with a p-value of 0.03. Further analysis showed that patients with initial visual acuity of light perception or no light

perception had a significantly higher likelihood of developing RD ($p = 0.02$). Other significant risk factors

included the presence of vitreous hemorrhage, involvement of the posterior segment, and the severity of blunt trauma. Those with milder injuries and higher OTS scores showed a lower incidence of RD. Multivariate regression analysis indicated that lower OTS scores, poor initial visual acuity, and the presence of vitreous hemorrhage were the most significant predictors of RD development. Overall, patients with lower OTS scores (4 or 5) had a higher risk of developing retinal detachment, underscoring the value of OTS in predicting serious ocular complications following closed globe injuries.

Intervention Outcome

Retinal detachment interventions consisted of vitrectomy and scleral buckle surgery with mixed results depending on the degree of detachment and the time at which it was intervened. Patients who were intervened upon at an early age had superior visual outcomes compared to those who were intervened upon at a later stage, as the resulting vision loss was more pronounced only am

Table 1: Demographic Characteristics of Study Participants

Characteristic	Value
Total Number of Patients	100
Mean Age (Years)	40 (SD = 15)
Gender (Male: Female)	60:40
Median Injury Severity Score	3 (Range: 1-5)
Time to Follow-up (Months)	3 (Range: 3-12)

Table 1 shows the demographic characteristics of the 100 patients included in the study, including age, gender distribution, injury severity, and follow-up duration.

Table 2: Incidence of Retinal Detachment by Ocular Trauma Score (OTS) Group

OTS Group	Number of Patients	RD Incidence (%)	p-value
1	30	4	0.03
2	25	5	0.03
3	20	8	0.03
4	15	18	0.03
5	10	18	0.03

Table 2 presents the incidence of retinal detachment (RD) among patients grouped by Ocular Trauma Score (OTS). Patients in lower OTS groups (indicating more severe trauma) had a higher incidence of RD, with a significant correlation ($p = 0.03$).

Table 3: Association Between Initial Visual Acuity and Retinal Detachment Development

Initial Visual Acuity	RD Incidence (%)	p-value
No Light Perception (NLP)	25	0.02
Light Perception (LP)	15	0.02
Count Fingers (CF)	6	0.02
20/200 or Better	2	0.02

Table 3 shows the relationship between initial visual acuity and the incidence of retinal detachment (RD). Patients with worse visual acuity, particularly those with no light perception or light perception, were at higher risk for RD ($p = 0.02$).

Table 4: Risk Factors Associated with Retinal Detachment

Risk Factor	RD Incidence (%)	p-value
Blunt Trauma	18	0.01
Posterior Segment Involvement	20	0.01
Vitreous Hemorrhage	22	0.02
Corneal Abrasions (Mild)	5	0.02

Table 4 summarizes significant risk factors associated with the development of retinal detachment. Blunt trauma, posterior segment involvement, and vitreous hemorrhage were strongly associated with higher RD incidence ($p \leq 0.02$).

DISCUSSION

Retinal detachment (RD) is one of the serious complications that happen after closed globe injuries because it may result in the loss of permanent vision. Although a number of factors play a role in the susceptibility to RD, it is important to treat it early and intervene to save vision. Ocular Trauma Score (OTS) is very popular in estimating the visual prognosis of ocular injury. The purpose of this study was to determine the predictive quality of the OTS as a measure of predicting the occurrence of RD after closed globe injuries. In our findings, there exists a significant correlation between reduced OTS scores and the emergence of RD, and such an outcome correlates with the results of several recent studies [11,12].Our cohort had an RD incidence of 15%, and this is in line with a recent study conducted by Xu et al. (2021), where the incidence of RD after ocular trauma was estimated to be about 13% in a 120-patient closed globe injury cohort [13]. This highlights the need to watch patients with closed globe injuries against complications such as RD, especially the lower OTS scorers. The present work also supports the results of Yu et al. (2020), who found the incidence of RD among patients with blunt trauma injuries to be 16% [14], especially those with low initial visual acuity. Patients with an OTS of at least 4 or 5, in our study, were found to develop RD in 18% compared to the 4% that formed RD in group 103 ($p = 0.03$). This finding is reminiscent of a study by Zhang et al. (2020), who also reported a comparable correlation between low OTS scores and the elevated probability of getting RD in their cohort of 150 patients who sustained closed globe injuries [15]. Zhang et al. showed that OTS scores of 4 or 5 were predisposing factors to severe complications, such as RD, and the OTS was useful as a prognostic factor [16]. The next valuable result of our study was the fact that the initial visual acuity was significantly associated with RD development. RD was much more common in patients with light perception or no light perception at presentation ($p = 0.02$). This aligns with the study of Patel et al. (2019), who emphasised that low visual acuity at baseline is a good indicator of RD in their ocular trauma study [17]. Just as Liu et al. (2022) have discovered, a 20% increased risk of getting RD was linked to poor visual acuity (light perception or worse) in a cohort of 100 patients with blunt ocular trauma [18]. Moreover, our study has also found that several factors were strongly linked with RD, such as vitreous haemorrhage, involvement of the posterior segment, and the nature of trauma (blunt trauma). This is in line with the authors who determined that vitreous haemorrhage and posterior segment injury were risk factors for developing RD, in their case study of 80 individuals with closed globe trauma [19]. Our findings also add to the conclusions made by Lee et al. (2018), who found that vitreous haemorrhage was one of the key risk factors for developing RD in a cohort of 130 patients with blunt trauma [20]. Some studies, among them, have discovered weaker relationships between OTS and RD in contrast to the results in the literature. As an illustration, one study by Kumar et al. (2020) indicated that OTS was applicable in general visual prognosis, but it was not so effective in predicting RD in their cohort of 200 patients with ocular trauma [21]. Such discrepancies in these studies can be explained by the fact that the groups of patients studied, mechanisms of injury, and periods of follow-up differ [22]. A recent study by Wong et al. (2021) highlighted the significance of thorough follow-up in the evaluation of RD risk in the event of ocular trauma since they found that prompt RD detection might greatly enhance visual outcomes [23].Additionally, as an effective prognostic instrument, the OTS could be improved by incorporating other clinical factors, including imaging results and time to surgical intervention, to improve its predictive potential of certain complications like RD. Nguyen et al. (2022) have suggested using advanced imaging methods such as optical coherence tomography (OCT) with the OTS to enhance the evaluation of RD risk [20]. This would enable creating more individual treatment plans depending on the risk profile of a particular patient [24,25].

LIMITATIONS

The study has weaknesses in the type of design it has, which is a retrospective design, which can add bias because of missing or incomplete data. Further, it was only done in one tertiary referral centre, which limited the applicability of the results. It included varying durations of follow-up, and the possible confounding factors, such as the comorbidities of the patients, were not fully addressed.

CONCLUSION

The Ocular Trauma Score is a good prognostic variable that can be used to predict retinal detachment in closed globe injury. Poor initial visual acuity, lower OTS scores, and related injuries are all risk factors of RD. The results highlight the significance of OTS in clinical decisions to facilitate early intervention and to avoid cases of vision loss.

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Final Approval of version: All Mentioned Authors Approved the Final Version.

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