Implication Of Orthoptic Scoring System for the Management of Orbital Floor Blowout Fracture

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ABSTRACT

Purpose: To introduce an orthoptic scoring system that can be implicated for decision-making about the management of patients with orbital floor blowout fractures.

Methodology:: The Ethical Review Board of the College of Ophthalmology and Allied Vision Sciences Mayo Hospital, Lahore, approved this study vide number1479/23. A comprehensive prospective cohort study was done at Mayo Hospital, Lahore on 44 patients using a self-designed proforma. The duration of the study was from March, 2023 to November, 2023. Forty-four participants were included with an age limit of 15-80 years. Complete orthoptic evaluation and review of medical records were done on each participant individually. All factors (diplopia, extraocular muscles movement, ecchymosis and others) included in this orthoptic scoring system were numbered according to individual patients' conditions. Descriptive data analysis was done by using SPSS Version 25.00. One sample t test was applied for analysis and p-value of ≤ 0.05 was used to define the significance threshold.

Results: Out of the 44 patients, 15.9% of patients were recommended for conservative treatment, surgery was deemed as a viable option for 29.5% of patients, and surgery was considered necessary for 54.5% of patients with an orbital floor blowout fracture. All the factors included in orthoptic scoring system were evaluated significant (p-value=0.00).

Conclusion: The orthoptic scoring system has the potential to serve as a valuable diagnostic tool in the management of patients with orbital floor blowout fractures. The study suggests that a comprehensive orthoptic evaluation is necessary to determine the optimal treatment for patients with orbital floor blowout fractures.

Keywords: Orbital fracture, Diplopia, Orthoptics, Enophthalmos, Ecchymosis.

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INTRODUCTION

The orbit, often known as the eye socket, is an intricate structure that protects the eyeball and its supporting tissues. The orbital floor is a complex area that comprises of other bones, the zygomatic, palatine, and maxilla. Its structure is made up of blood vessels, nerves, and muscles, which include the inferior rectus and inferior oblique muscles.[1] Usually caused by violent facial trauma, orbital floor blowout fractures mostly

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affect the medial wall and floor of the orbit. These fractures, which are typified by thin bone, can cause double vision and drooping eyes, which affect the muscles, tissues, and nerves surrounding the eye.[2]

Orbital floor blowout fractures impede vision and have an aesthetic impact on the patient's apperance.[3] Double vision, enophthalmos, and soft tissue edema are the hallmarks of this orbital floor blowout fracture. Horizontal diplopia may result from defects in the innervation or medial or lateral rectus muscles compromised by fractures. This misalignment of the visual axes results in the perception of adjacent images. The type of diplopia depends on the type of extraocular muscles involved. The frequency of vertical diplopia is the highest in the case of orbit floor blowout fracture.[4] Enophthalmos refers to the backward displacement of the eyeball within the eye socket, which is a typical indication of orbital floor blowout fractures. Intra-orbital edema can lead to alterations in the orbital morphometrics.[5] The initial evaluation consists of a thorough clinical examination, particularly on ophthalmic assessment associated with diplopia, extraocular movements, and visual acuity.[6] The Hess chart is typically used to evaluate ocular motility problems in patients who have orbital injuries. Imaging studies, like computed tomography (CT) scans, are very important for determining where the fracture is and its damage.[7]

There are two primary therapeutic modalities available for patients diagnosed with orbital floor blowout fractures (OFBF): conservative and surgical treatment. The conservative management strategy for an orbital floor blowout fracture comprises a non-surgical method to minimize symptoms and promote the body's inherent healing mechanisms.[8] Healthcare professionals may choose a conservative approach when there is modest displacement of the orbital floor and a lack of severe symptoms. A careful management plan is required for the patients with orbital floor blowout fracture. For mild fractures, conservative therapy usually works well; however, surgery is usually necessary for more significant fractures. Surgical techniques that strengthen and restore the orbital floor use synthetic implants or autologous grafts, such as transconjunctival and other surgeries. To get the best results, orthoptists, ophthalmologists and maxillofacial surgeons must work together.[9]

Computed tomography (CT) scans and other diagnostic techniques are necessary for treatment planning in order to make decisions about the patient's condition, symptoms, and fracture severity.[10] The study's proposed orthoptic scoring system combines orthoptic evaluations with criteria such as age, extraocular muscle entrapment, soft tissue edema, type of diplopia[11], and extent of the fracture. This research aims to evaluate the significance of orthoptic evaluation in establishing the most effective treatment strategy for rupture fractures of the orbital floor by orthoptic scoring system.[12]

METHODOLOGY

The Ethical Review Board of the College of Ophthalmology and Allied Vision Sciences / Mayo Hospital, Lahore approved this study vide no.1479/ 23. The research employed a prospective cohort design and was conducted over a period of Nine months. At pre-determined time intervals, the study design entailed monitoring and analyzing a cohort of 44 patients[13] from the Oral and Maxillofacial Department of Mayo Hospital.

The sampling formula was

$$n = \{ \frac{z1-\alpha/2\sqrt{2P(1-P)} + z1-\alpha/2\sqrt{P1(1-P1) + P2(1-P2)}}{(P1-P2)^2}$$

The study's sample comprised patients only from the Oral and Maxillofacial Department of Mayo Hospital in Lahore. The inclusion criteria were designed to select patients between the ages of 15 and 80 who had isolated orbital floor blowout fractures. This ensured a narrow age range and a specific subgroup for more focused research. The inclusion criteria for the sample focused on patients with recognizable ocular features by requiring normal direct and indirect pupillary responses, as well as normal ocular motility (NRC). The exclusion criteria consisted of excluding patients with concomitant strabismus and those with other types of orbital fractures, to conduct a specific evaluation of the impact and treatment results of

solitary orbital floor blowout fractures. The data collection procedures included a proforma with a scoring system, evaluations of medical records, physical examinations, and the use of several devices. The study lasted for a period of three months and was carried out at Mayo Hospital's Oral and Maxillofacial Department in Lahore. Data analysis was performed using SPSS Version 25.00, utilizing rigorous statistical methods (One sample t test) to extract significant findings from the gathered data.

RESULTS

Fracture Size Involved

In relation to the degree of floor involvement in orbital fractures, 52.3% of participants had fractures affecting less than 50% of the floor, 29.5% had fractures affecting 50-70% of the floor, and 18.2% had fractures affecting more than 70% of the floor (Table 1).

Table-1:

Fracture Size Involved	Frequency	Percent	P -Value
< 50% Orbital Floor involved		52.3	0.00
50-70% Orbital Floor involved		29.5	0.00
>70% Orbital Floor involved		18.2	0.00
Total	44	100.0	0.00

Double Vision

Within the group of individuals being studied, 29.5% did not report any instances of diplopia, 9.1% experienced diplopia in a horizontal direction, 54.5% experienced diplopia in a vertical direction, and 6.8% reported diplopia with a twisting or rotating sensation (Table 2).

Table -2:

Double Vision	Frequency	Percent	P -Value
No Complain of Diplopia	13	29.5	0.00
Horizontal Diplopia	4	9.1	0.00
Vertical Diplopia	24	54.5	0.00
Torsional Diplopia	3	6.8	0.00
Total	44	100.0	0.00

Ecchymosis and Soft Tissue Edema

Ecchymosis and soft tissue edema reported by 43.2% individuals displayed no or minimal indications, 47.7% had a moderate manifestation, and 9.1% demonstrated severe ecchymosis and soft tissue edema (Table 3).

Table- 3:

Ecchymosis and Soft Tissue Edema	Frequency	Percent	P -Value
Absent or Minimal	19	43.2	0.00
Moderate	21	47.7	0.00
Severe	4	9.1	0.00
Total	44	100.0	0.00

Extraocular Muscle Entrapment

Regarding extraocular muscle entrapment, 20.5% of subjects had no issues, 20.5% had entrapment without impacting eye movement, and 59.1% encountered entrapment resulting in a notable restriction of eye movement. These findings clarify the frequency and consequences of extraocular muscle entrapment in people who have isolated fractures in the floor of the eye socket (Table 4).

Table- 4:

Extraocular Muscle Entrapment	Frequency	Percent	P -Value
No Complain	9	20.5	0.00
Present (Not affecting Ocular Motility)	9	20.5	0.00
Present (Significant limitation of Ocular Motility)	26	59.1	0.00
Total	44	100.0	0.00

Treatment

Regarding management, 15.9% of individuals received conservative treatment, 29.5% had surgical treatment strongly recommended, and 54.5% got surgery. The percentages presented here illustrate the distribution of treatment methods among persons who have isolated orbital floor blowout fractures (Table 5).

Table -5:

Interpretation of Management	Frequency	Percent	P -Value
Conservative Treatment	7	15.9	0.00
Surgical Treatment Strongly Considered	13	29.5	0.00
Surgery Indicated	24	54.5	0.00
Total	44	100.0	0.00

DISCUSSION

Examining treatment options among the patients with orbital floor blowout fracture reveals the importance of orthoptics and scoring system based on orthoptic evaluation. According to the Orthoptic Scoring System, 54.5% of patients needed surgery. These findings support previous research on scoring methods to assess ocular fracture treatment. This study found that clinical criteria in scoring systems improved therapeutic decision-making, especially in surgical patients. This study corresponds to the prior research showing that the Orthoptic Scoring System helps patient's management decisions and enhance patient outcomes.[14]

This study examined 44 orbital floor blowout fracture patients' demographics and clinical features. It carefully assessed age distribution, fracture size, double vision, enophthalmos, ecchymosis, soft-tissue edema, and extraocular muscle entrapment. Many symptoms were found, including vertical diplopia and somewhat sunken eyeballs. By integrating the findings into previous studies, the study increases clinical understanding of these fractures. It also illustrates how an orthoptic scoring system might guide personalized and effective treatment.[15]

A broad age distribution was seen in the study, with 36.4% under 25, 27.3% between 25 and 40, and 36.4% beyond 40. Shah AH et al. found a similar pattern in orbital fractures. Including different age groups helps determine how age affects orbital floor blowout fractures and their treatment. Pediatric children may have different characteristics than older patients, which may affect surgical or non-surgical intervention decisions. According to fracture size, 52.3% of cases had fractures less than 50% of the floor, 29.5% had fractures 50% to 70%, and 18.2% had fractures over 70%. The data distribution matches Shah AH et al., underlining the importance of fracture size in treatment decisions. They found that bigger fractures require surgery due to a higher risk of complications. This data supports the idea that fracture size is crucial in orbital floor blowout fracture therapy.[16]

Diplopia, enophthalmos, bruising, soft tissue edema, and extraocular muscle entrapment were found in the study. Moreover, 54.5% of participants had limited eye movement. This supports a 2012 study on the effects of extraocular muscle limitation on eye movement and the need for surgery. The study found that 68.2% of participants had minor enophthalmos (less than 2mm displacement). This discovery matches previous research on orbital blowout fractures. The correlation between findings of the study and the present literature supports their reliability and highlights the importance of clinical indicators in orbital floor blowout fracture therapy.[17]

Scholarly research agrees that orthoptics can assess and treat orbital fractures. The 2021 study proposed by Kersten RC et al. stressed the need of extraocular muscle testing, especially in orbital injuries. Orthoptic exams, including motility and binocular vision assessments, are critical for determining appropriate therapy. The study demonstrates a strong link between extraocular muscle entrapment and eye movement problems. This emphasizes orthoptics' and Orthoptists' role in identifying surgical patients.[18]

The Orthoptic Scoring System's ability to identify surgical cases is demonstrated by its strong connection with extraocular muscle entrapment. The study examined how scoring systems measure muscular entrapment and predict mobility limitation. The study advised using scoring systems in clinical practice to improve decision-making in extraocular muscular entrapment cases. This study shows that the Orthoptic Scoring System guides treatment options, especially in cases of frequent extraocular motility disorder.[19]

A new study found an association between the Orthoptic Scoring System and enophthalmos severity, emphasizing the importance of analyzing several clinical markers to make educated treatment decisions. The researchers created a scoring system that included fracture severity, enophthalmos, and diplopia to determine the best surgical or non-surgical method. This study shows that orbital floor blowout fracture scoring systems must include numerous parameters to accurately determine

treatment needs.[13]

The Orthoptic Scoring System showed a substantial association with fracture extent, enophthalmos severity, and diplopia prevalence. In 2023, experts stressed the importance of complete orthoptic evaluations in predicting orbital fracture treatment outcomes. The researchers concluded that orthoptic examinations can help adjust treatment regimens to clinical characteristics, increasing patient outcomes. The reliability of the Orthoptic Scoring System in furnishing exhaustive instructions for isolated orbital floor blowout fracture therapy is demonstrated by its congruence with the findings of the researchers. The research emphasizes the robust correlation between numerous clinical variables and the suggested Orthoptic Scoring System, establishing the foundation for precise and individualized treatment suggestions.[20]

CONCLUSION

The orthoptic scoring system has the potential to serve as a valuable diagnostic tool in the management of patients with orbital floor blowout fractures. The study suggests that a comprehensive orthoptic evaluation is necessary to determine the optimal treatment for patients with orbital floor blowout fractures.

Conflict of Interest: None to declare

Ethical Approval: The study was approved by the Institutional Review Board / Ethical Review Board Vide No. COAVS/1483/23.

Author Contributions: Ayesha Kanwal: Concept, Design, Data Collection, Article Draft.

Ayesha Sarfraz: Literature Review, Data Analysis, Critical Review.

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