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Original Research Article

Distribution of Periocular Soft Tissue Injuries without the Involvement of Globe, Based on Observed Clinico-Anatomical Patterns of Eyelid Injuries: An Observational Study

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Abstract:

Aim: The article presented a classification system for periocular soft tissue injuries without the involvement of globe, based on observed clinico-anatomical patterns of eyelid injuries.

Methods: This study was carried out at Department of Plastic Surgery from January 2018 to December 2020. A total of 35 eyelid injuries in 30 patients were evaluated in this study.

Results: There were 46.66% male and 53.34% females. The most common mechanism of injury in our series was road traffic accident, followed by thermal burns. Uncommon causes included bull horn injury and blouse hook injuries. The age range varied from 7 months to 54 years. Among post-traumatic injuries, majority injuries were of Type V (70%). Isolated Type III and Type IV injuries were not seen in our series, whereas isolated Type II injuries were more common among all periocular zones.

Conclusion: The Classification seems to be a reliable system to address eyelid injuries. While further multicentric studies are required to assess the usefulness and promote widespread adoption of the system, the simplicity and comprehensiveness make this system particularly appealing. We believe that this classification scheme would guide the ophthalmic and facial reconstructive surgeons to provide optimal outcomes in such injuries.

Keywords: classification system, periocular soft tissue injuries

Introduction

Eye injuries are serious ocular incidents that constitute 10–15% of all ophthalmic diseases with a worldwide incidence of more than 55 million/year. [1,2] With this in mind, many researchers endeavored to better understand ocular injuries to improve management techniques. However, despite developments into studying the consequences of ocular trauma, it remained difficult up until the introduction of Kuhn's terminology and Birmingham classification system for ocular trauma. [3]

The terminology and the classification developed a prognostic model and a scoring system to predict the visual outcome of patients after ocular trauma. The system considered the mechanism of injury, the initial presenting visual acuity, the presence and the absence of afferent pupillary defects, and the zone of the injury. This system was widely adopted by multiple researchers. [4-6]

Ocular trauma is an important cause of visual impairment and a leading cause of preventable monocular blindness. [7] Worldwide, there are approximately 1.6 million people blind from eye injuries, an additional 2.3 million people with bilateral low vision from this cause and almost 19 million with unilateral blindness or low vision.8 In developing countries, eye injuries are not only more common but also more severe in their effect and this may be attributed to socioeconomic background, inadequate safety measures, lack of optimum treatment facilities, use of traditional eye medication and poor education. [8] Studies from

Nigeria and other parts of Africa have reported ocular trauma as an important cause of monocular blindness. [9-12]

The rationale for classifying ocular trauma is to determine and document severity of injury. It also provides a standardized description and terminology for the injury, which is internationally accepted and understood. The type and extent of damage sustained by a traumatised eye depends on both the mechanism and force of the trauma. [13] Common consequences of ocular blunt trauma include periocular lid ecchymosis/ haematoma, orbital fractures, subconjunctival haemorrhage, corneal abrasions/ulcers, hyphaema, cataracts, lens dislocation/ subluxation, contusions, retinal detachments and globe rupture. Penetrating/perforating injury could lead to lacerations of the eyelids, cornea or sclera which may be associated with intraocular haemorrhage, retained foreign bodies or tractional retinal detachment. [13,14]

The article presented a classification system for periocular soft tissue injuries without the involvement of globe, based on observed clinico-anatomical patterns of eyelid injuries.

Materials and Methods

This study was carried out at Department of Plastic Surgery, Nalanda medical college and Hospital,Patna, Bihar, India from January 2018 to December 2020. A total of 35 eyelid injuries in 30 patients were evaluated in this study. We searched the English literature for existing classification systems for periocular trauma. A search in multiple internet databases, including PubMed, Medline and Google scholar was carried out using the keywords 'Eyelid injuries' 'Eyelid Trauma' 'Periocular Trauma' 'Periocular injuries' and 'Classification AND Eyelid Injuries' were performed. Other medical search engines such as Trip database and ACCESSS Federated Search database were also explored using the same search terms. A review of existing literature failed to reveal a classification system that addresses the spectrum of eyelid injuries. We designed a system of classification of periocular soft tissue injuries after reviewing patient records and analysing the injuries that had presented to us previously. This system was discussed among the reconstructive surgeons of our unit, and the taxonomy was finalised. We applied the classification system prospectively to patients with periocular trauma presenting to our hospital. A final classification system was then agreed on among the members of the reconstructive surgery unit. Based on the classification scheme and review of existing literature, an algorithm was designed to facilitate repair and reconstruction.

Approach

To conceptualise periocular anatomy, the periorbital region has been divided into 4 zones as following: Zone I – upper eyelid; Zone II – lower eyelid; Zone III-medial canthus; and Zone IV – lateral canthus. Spinelli had originally designed this nomenclature to divide the periorbital region with an aim to approach reconstruction options for post-surgical eyelid defects. [15] We adopted this nomenclature in our classification scheme to address the anatomical component. The eyelid zones were more rigidly demarcated in our system to reduce inter-observer discrepancy. We defined Zone I as upper eyelid in a region extending from a point 1 mm lateral to the lacrimal punctum to 3 mm medial to lateral ocular commissure on the palpebral margin. Similarly, Zone II represented the lower eyelid in a region at a point 1 mm lateral to the lacrimal punctum to 3 mm medial to lateral ocular commissure on the palpebral margin. An imaginary perpendicular line dropped from the palpebral margin to orbital rim at each of these points helped in demarcating the zones more clearly. Type I injuries were the one involving Zone I, Type II injuries were the one involving Zone II, Type III injuries involved the Zone III and Type IV injuries involved the Zone IV. The eyelid injuries were addressed in anteroposterior and horizontal dimensions. Anterio-posterior tissue involvement was divided into superficial (epidermo-dermal injury), partial thickness (Subcutaneous injury extending up to but not involving palpebral conjuctiva) and full thickness losses (involvement of palpebral conjunctiva) for injuries of Type I and Type II. These Type I and Type II full thickness injuries of the upper and lower eyelids, respectively, were further defined according to the horizontal extent of eyelid tissue lost (¼, ½ and more than ½ loss of eyelid tissue). Antero-posterior tissue involvement for Type III and Type IV (Medial and lateral canthus, respectively) injuries were again subdivided into superficial (epidermo-dermal injury), partial thickness (Subcutaneous injury extending up to but not involving periosteum) and full thickness losses.

If the injuries involved more than one zone, it was classified as a Type V injury with a subclassification nomenclature added to depict the individual anatomical zones involved. To indicate side of involvement, a 'Rt' or 'Lt' was included in the nomenclature representing right or left, respectively. Lacrimal system involvement in Type III injuries was demonstrated with an 'L'. We subdivided the lacrimal apparatus injury into simple and complex types. The former, involving only the lacrimal canaliculi, and the latter involving, either, the common canaliculus, nasolacrimal sac or nasolacrimal duct. Simple lacrimal injuries were monocanalicular or bicanalicular. We excluded globe injuries and skeletal injuries from our classification system to maintain lucidity in the system.

Results

Table 1: Demographic data

Gender	N	%
Male	14	46.66
Female	16	53.34
Mode of injury		
RTA	18	60
Thermal burns	8	26.66
Others	4	13.34

There were 46.66% male and 53.34% females. The most common mechanism of injury in our series was road traffic accident, followed by thermal burns. Uncommon causes included bull horn injury and blouse hook injuries. The age range varied from 7 months to 54 years.

Table 2: Post traumatic injuries

Post traumatic injuries	N	%
Type I	4	13.34
Type II	5	16.66
Type III	0	0
Type IV	0	0
Type V	21	70%

Among post-traumatic injuries, majority injuries were of Type V (70%). Isolated Type III and Type IV injuries were not seen in our series, whereas isolated Type II injuries were more common among all periocular zones.

Discussion

Eyelids are important structures and play a role in protecting the globe from trauma, brightness, in maintaining the integrity of tear films and moving the tears towards the lacrimal drainage system and contribute to aesthetic appearance of the face. Ophthalmic trauma is an important cause of morbidity among individuals and has also been responsible for the additional cost of healthcare. Orbital and periorbital regions may be affected by many traumatic factors. International studies have estimated the lifetime prevalence of ocular injuries to be 14.4% –19.8%, whereas the incidence rate of hospitalised eye injuries was found to be 13.2/100,000. [16,17]

There were 46.66% male and 53.34% females. The most common mechanism of injury in our series was road traffic accident, followed by thermal burns. Uncommon causes included bull horn injury and blouse hook injuries. The age range varied from 7 months to 54 years. Among post-traumatic injuries, majority injuries were of Type V (70%). Isolated Type III and Type IV injuries were not seen in our series, whereas isolated Type II injuries were more common among all periocular zones. Females were more commonly affected in cases of thermal injuries affecting the periocular region. Thermal and chemical burns lead to injuries in the periocular region. While the globe is protected in the majority of cases due to the reflex closure of eyelids, they may be involved in more severe burns. [18,19]

Classification systems are necessary to provide a framework in which to scientifically study the aetiology, pathogenesis and treatment of diseases in an orderly fashion. Systems of injury classifications enable a systematic description of injuries. [20] Without a standardised terminology of eye injury types, it is impossible to design eye injury registries or organise research in the field of ocular trauma, and the communication between reconstructive surgeons remains ambiguous. A proper classification system also helps to facilitate the comparison of health-related data within and across populations and over time as well as in the compilation of nationally and internationally homogenous data. [20] With a thorough understanding of the causes and types of eyelid lacerations, it is possible to develop a better preventive strategy and hence improve the public health policy in this respect. In addition, a systematic approach to these complex injuries would aid the reconstruction specialist to restore the anatomy of the region.

Different well-established classification systems are available for globe injuries and orbital skeletal injuries. [21] None of these classification schemes have taken into account the varied spectrum of periocular injuries. Repair and reconstruction of injuries vary with severity and extent. [22,23] Approach to these injuries should be performed in an orderly fashion. An algorithm for repair of injuries would help reconstructive surgeons to approach the defects systematically. With the availability of numerous reconstruction strategies, it becomes necessary to help the ophthalmic reconstructive surgeon in decision making to provide a suitable treatment for a given defect.

Prognosis of periocular soft tissue injuries takes into consideration the aesthetic appearance in addition to eyelid function. Prognosis and outcomes of these injuries depend on a number of variables such as the severity of trauma, the extent of injuries, the involvement of adjacent skeletal system and globe, time of presentation following trauma, the presence of foreign bodies and even age of the patient.

Conclusion

The Classification seems to be a reliable system to address eyelid injuries. While further multicentric studies are required to assess the usefulness and promote widespread adoption of the system, the simplicity and comprehensiveness make this system particularly appealing. We believe that this classification scheme would guide the ophthalmic and facial reconstructive surgeons to provide optimal outcomes in such injuries.

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