Cirugía y Cirujanos. 2015; 83(1): 9-14

CIRUGÍA y CIRUJANOS

Órgano de difusión científica de la Academia Mexicana de Cirugía

Fundada en 1933

www.amc.org.mx www.elsevier.es/circir

ORIGINAL ARTICLE

Ocular Trauma Score comparison with open globe receiving early or late care☆

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Received 5 June 2014; accepted 4 August 2014

KEYWORDS
Visual acuity;
Visual deficiency;
Eye injuries;
Ocular Trauma Score;
Ocular trauma

Abstract

Background: The Ocular Trauma Score (OTS) is a scale that estimates the prognosis of injured eyes after treatment, with results that are consistent with those of longitudinal studies. The time between injury presentation and initial care has been described as a prognostic factor for visual outcome, but the OTS variables of eyes receiving early or delayed care after trauma have not been compared.

Material and methods: A non-experimental, comparative, retrospective, cross sectional study including patients from either gender, aged 5-80 years, with open globe trauma, without previous diseases that reduced visual acuity or previous intraocular surgery. The distribution of the OTS variables was identified. The sample was divided into two groups: group 1 (time between trauma occurrence and initial care ≤ 24 hours), and 2 (time > 24 hours). The frequency of OTS categories of unfavourable prognosis (1-3) was compared between groups (x^2).

Results: A total of 138 eyes of 138 patients were studied. The mean age of the patients was 28.8 years, with 65.2% male. The waiting time ranged 2-480 hours (mean 39.9). Group 1 had 103 eyes assigned (74.6%), and 35 to assigned to group 2 (25.4%). The proportion of categories 1-3 in group 1 (82.5%, n = 85) did not differ from that in group 2 (80%, n = 28; p = 1.0).

Conclusion: The proportion of OTS categories with an unfavourable prognosis did not show significant differences between the eyes who received care before or after 24 hours that could be contributed to a different outcome, besides the delay in starting treatment.

☆Please cite this article as: Razo-Blanco Hernández D. M. et al. Comparación del Ocular Trauma Score en traumatismo con globo abierto, atendido temprana o tardíamente. Cirugía y Cirujanos. 2015; 83: 9-14.

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PALABRAS CLAVE
Agudeza visual;
Deficiencia visual;
Lesiones oculares;
Ocular Trauma Score;
Traumatismo ocular

Comparación del Ocular Trauma Score en traumatismo con globo abierto, atendido temprana o tardíamente

Resumen

Antecedentes: El Ocular Trauma Score (OTS) es una escala que estima el pronóstico del ojo lesionado después del tratamiento. El tiempo entre la presentación de la lesión y el tratamiento inicial se ha descrito como un factor pronóstico en el desenlace visual, pero las características del OTS en ojos que reciben tratamiento temprano o tardío después del traumatismo no han sido comparadas.

Material y métodos: Estudio observacional, comparativo, retrospectivo, transversal. Se incluyó a pacientes de cualquier género, con edades entre los 5 y los 80 años, con traumatismo con globo abierto, sin enfermedades previas que disminuyeran la agudeza visual ni cirugía intraocular previa. Se identificaron la distribución de las variables del OTS y la frecuencia de las categorías de pronóstico desfavorable (1-3). La muestra se dividió en 2 grupos: 1 (tiempo transcurrido entre el traumatismo y la atención ≤ 24 h) y 2 (tiempo transcurrido > 24 h). Se comparó la frecuencia de las categorías de pronóstico desfavorable entre grupos (x^2).

Resultados: Ciento ochenta y tres ojos de 138 pacientes, con una edad promedio de 28.8 años, el 65.2% de género masculino. El rango del tiempo transcurrido fue 2-480 h (media 39.9); 103 ojos se asignaron al grupo 1 (74.6%) y 35 al grupo 2 (25.4%). La proporción de las categorías 1-3 en el grupo 1 (82.5%, n = 85) no difirió de la del grupo 2 (80%, n =28; p = 1.0).

Conclusión: La proporción de las categorías del OTS con pronóstico desfavorable no mostró diferencias significativas, entre los ojos atendidos antes y después de 24 h, que pudieran contribuir a un resultado distinto, además del retraso en el tratamiento.

Background

Ocular trauma leads to monocular blindness during productive age with a significant socio-economic impact which turns it into a world-wide issue of public health[1]. It is more frequent among men (78.6%)[2]; age of presentation differs across studies, with peaks between 25 and 34 years (19.7%)[3] or between 45 and 64 years (30.2%)[4].

The classification system of mechanic ocular lesions classifies ocular trauma, according to the ocular wall condition (cornea and sclera), as closed-globe (without resolution of total continuity) or open-globe (with resolution of total continuity of ocular wall). 4 parameters are assessed: type (lesion mechanism), degree (visual acuity), pupil (afferent pupil defect) and area (utmost posterior localization of lesion)[5], which have a prognosis value for visual outcome[6].

There are characteristics that reduce recuperation probability, regardless of initial visual acuity. In a multiple regression analysis, the characteristics related to the worst visual outcome were the following: initial low visual acuity (ß = 0.35; p < 0.001), postoperative afferent pupil defect (ß = 0.24; p < 0.001), retinal detachment (ß = 0.168; p < 0.001), scleral laceration (ß = 0.139; p < 0.004)[7], and period of time between lesion and surgery (rho = −0.144; p = 0.003)[8], although some studies have not found that relation[9]. Plestina Borjan et al. reported low frequency of endophthalmitis in open-globe trauma due to war-like scenarios[10]; Ahmed and his team discovered that prophylaxis with antibiotics reduced its incidence[11]. The reason for poor prognosis in eyes in which the wound heals late could be because, even before surgery, its condition was worse than the condition of promptly operated eyes.

Pre-operative characteristics can be compared through the Ocular Trauma Score (OTS), a standardised scale that estimates visual prognosis 6 months after trauma; such scale places the injured eye in one of 5 categories according to the following variables: initial visual acuity, ocular rupture, endophthalmitis, ocular perforation, retinal detachment and afferent pupil defect[12]. OTS estimate is consistent with longitudinal study results[13-16]; there is a < 50% of probability to a reach visual acuity > 20/40 after treatment in eyes classified from 1 to 3[12].

Some studies have assessed the time elapsed between lesion and surgery as a prognosis factor. However, there were no OTS characteristics reported in the samples. Therefore, it is difficult to compare pre-operative prognosis between late and promptly treated eyes.

A study was conducted in order to compare the distribution of OTS categories among patients with open-globe trauma treated before and after 24 hours, for the purpose of identifying significant differences that could contribute to the result, as well as the delay in treatment.

Material and methods

A comparative, retrospective, cross-sectional and observational study was carried out. The target population was made up of patients with open-globe trauma in Mexico City and the metropolitan area. The available population was patients treated due to open-globe trauma in a general hos-

pital from Mexico City, between January 1st, 2005 and May 30th, 2013. Said study was developed between January 1st, 2012 and June 30th, 2013. It complied with the principles of the Declaration of Helsinki and it was authorised by the commissions of Research and Research Ethics of the institution where it was carried out.

It included patients of any gender, between 5 and 80 years, with surgically treated open-globe trauma, without previous ocular diseases that reduced visual acuity or previous intra-ocular surgery, who were classified by the classification system of mechanic ocular lesions. Patients without a complete medical history were excluded.

Each patient was classified as per OTS: the initial best-corrected visual acuity provided the following positive results: 60 points when the injured eye did not perceive light; 70 points when visual acuity was between light perception and hand movement; 80 points between 1/200 and 19/200, 90 points between 20/200 and 20/50; and finally, 100 points to the eyes with visual acuity ≥ 20/40[12].

Points were deducted as per the following conditions: rupture (−23 points), endophthalmitis (−17 points), perforation (−14 points), retinal detachment (−11 points) and afferent pupil defect (−10 points)[12]. According to the results, the injured eye was classified into one of 5 OTS categories: 1 (0-44 points), 2 (45-65 points), 3 (66-80 points), 4 (81-91 points) or 5 (92-100 points), each of them with a different probability of reaching a visual acuity range after 6 months. The best prognosis was category 5[12].

The characteristics of the sample were identified according to the classification system of ocular mechanic lesions and the time elapsed, in hours, between the ocular trauma and initial care. The sample was divided into 2 groups: 1 (time elapsed ≤ 24 hours) and 2 (time elapsed > 24 hours).

The distribution of OTS variables was identified, as well as of each of the categories in the sample and in each group. The frequency of the worst OTS prognosis categories (1-3) was compared among groups through x^2. Furthermore, a sensitivity analysis was carried out in order to determine whether the proportion of eyes with unfavourable prognosis changed significantly after a certain amount of hours had passed between the trauma and initial care.

Results

138 eyes of 138 patients were evaluated. The patients were between 5 and 80 years (average ± standard deviation [SD] 28.8 ± 14.57 years); 90 eyes were of males (65.2%) and 73 eyes from the left side (52.9%). The distribution of the characteristics of the mechanic ocular lesion classification system is illustrated in table 1.

The distribution of OTS variables is illustrated in table 2; 12 eyes were classified into OTS category number 1 (8.7%), 41 eyes into 2 (29.7%), 60 into 3 (43.5%), 17 into 4 (12.3%) and 8 into 5 (5.8%); the OTS categories of 103 eyes (81.9%, confidence interval [CI] of 95%, 75.5 to 88.3) were of unfavourable prognosis. The time elapsed varied from 2 to 480 hours (average ± SD 39.89 ± 75.02); 103 eyes were classified into group 1 (74.6%) and 35 into group 2 (25.4%) (Fig. 1).

No difference was found between the proportion of eyes categorized into 1-3 in eyes that were treated before 24 hours had passed (82.5%, n = 85) and those eyes treated after 24 hours (80%, n = 28; p = 1, table 3). The sensitivity analysis did not identify a temporary cut-off point in which the proportion of eyes with unfavourable prognosis increased significantly.

Discussion

The outcome of ocular open-globe trauma may be poor due to alterations that appear after the lesion[17] or because of initial ocular conditions[12]. It is not possible to conduct a prospective assessment to determine whether delayed

Table 1 Distribution of characteristics of mechanic ocular lesion classification system in the sample (n = 138).

Characteristics		Group 1 (n = 103)		Group 2 (n = 35)		p[a]
		n	%	n	%	
Type	A	31	30.1	13	37.1	0.6
	B	69	67	20	57.1	0.33
	C	3	2.9	2	5.7	1.0
Degree	1	6	5.8	3	8.6	1.0
	2	6	5.8	5	14.3	0.15
	3	13	12.6	3	8.6	1.0
	4	60	58.3	21	60	1.0
	5	18	17.5	3	8.6	0.24
Pupil	Positive	3	2.9	0	0	0.41
	Negative	100	97.1	35	100	
Area	I	37	35.9	12	34.3	1.0
	II	36	35	11	31.4	1.0
	III	29	28.1	12	34.3	0.76

[a]X^2.

Table 2 Distribution of Ocular Trauma Score variables in the sample (n = 138).

Variable		Group 1 (n = 103)			Group 2 (n = 35)			p[a]
		n	%	95 % CI	n	%	95 % CI	
Best-corrected initial visual acuity	NLP	17	16.5	9.33-23.67	2	5.7	0-14.79	0.12
	LP to HM	54	52.4	42.75-62.05	22	62.9	43.96-81.84	0.31
	1/200 to 19/200	10	9.7	3.98-15.42	2	5.7	0-14.79	0.98
	20/200 to 20/50	15	14.6	7.78-21.42	6	17.1	2.34-31.86	1.0
	≥ 20/40	7	6.8	1.94-11.66	3	8.6	0-19.59	1.0
Rupture		31	30.1	21.24-38.96	13	37.1	18.16-56.04	0.6
Endophthalmitis		2	1.9	0-4.54	0	0	0	1.0
Perforation		0	0	0	0	0	0	-
Retinal detachment		8	7.8	2.62-12.98	1	2.9	0-9.48	1.0
Afferent pupil defect		3	2.9	0-6.14	0	0	0	1.0

CI: confidence interval.
[a] X^2.

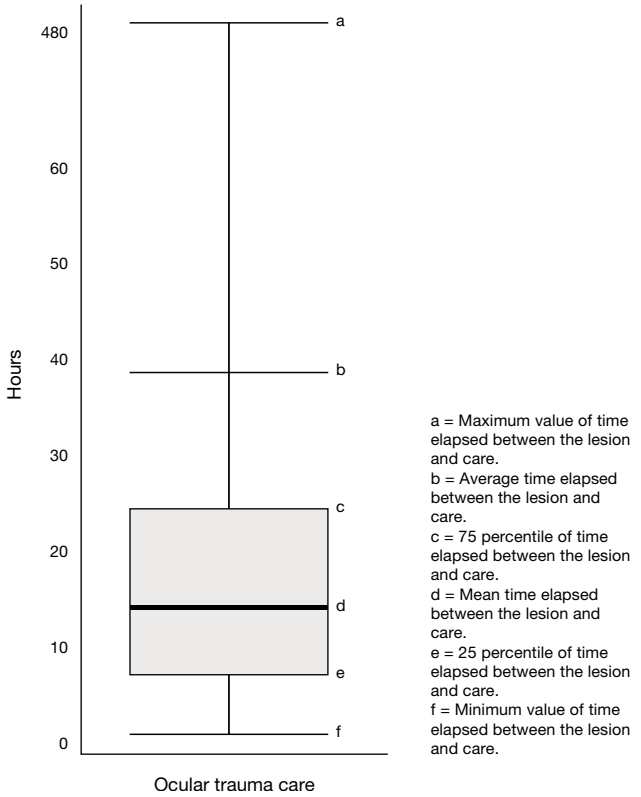

Fig. 1 Time distribution between lesion and treatment in the sample (n = 138).

care is an outcome modifier. Therefore, this study used OTS categories as subrogated variables. The proportion of cases with unfavourable prognosis OTS categories did not differ between eyes treated before 24 hours had passed and those treated after.

Late care of open-globe trauma favours the development of complications, such as intra-ocular healing and endophthalmitis. The latter, which has a low prevalence during the initial assessment (4-8%)[18-20], is the second variable that reduces the OTS score the most; the following risk factors may encourage endophthalmitis development: intra-ocular foreign body (odds ratio [OR] 7.52)[18], wound contamination (OR 5.3)[21], rupture of posterior capsule of crystalline lens (OR 4.4)[21], age > 50 years, wound localization and size, and trauma caused in a rural area[20].

Faghihi[19] and Bhagat et al.[20] reported that a delay in closing the wound, particularly of more than 24 hours, increases the risk of developing endophthalmitis, even without an intra-ocular foreign body. Jonas[22] and Zhang et al.[23] found a low frequency of endophthalmitis in wounds closed before 24 hours (OR 0.6). Essex et al. [21] discovered that for every hour elapsed since the open-globe trauma occurred, the OR to develop endophthalmitis increased 1.01. Said authors considered the time taken for the wound to close as the only modifiable factor to prevent endophthalmitis. However, they did not find differences between the final visual outcome in eyes with and without endophthalmitis.

In this study, endophthalmitis was infrequent (1.4%) and was present in eyes treated before 24 hours had passed. Narang et al.[24] reported that delaying wound closure was associated to low visual acuity, not to infection. Furthermore, Lieb et al.[25] did not find differences between the visual acuity in eyes treated on the same day of the trauma and those treated a day after (p = 0.7).

According to OTS, rupture is the variable that reduces the score more than endophthalmitis. Rupture can lead to extensive lesions when opening the ocular wall from the inside out. Such damage occurs from the moment of trauma and is not related to delayed wound closure. The frequency of rupture in this study was similar between the eyes treated before 24 hours and those treated after.

As the proportion of OTS categories 1-3 did not differ between the eyes treated before and after 24 hours, the expected outcome should not range among them. A lower result could be explained by other factors, such as late initial treatment.

The availability and access to specialized health services may delay surgical care and modify the visual outcome es-

Table 3 Proportion of eyes with categories 1 to 3 for each group.

Time elapsed between the lesion and initial care	OTS categories		Total	p[a]
	1-3	4 and 5		
≤ 24 hours	85	18	103	1.0
> 24 hours	28	7	35	
Total	113	25	138	

OTS: Ocular Trauma Score.
[a] X^2.

timated by OTS. However, medical treatment can be implemented from the first contact and should not initiate until the ophthalmologist sees the patient. The best way to achieve a better surgical result is to preserve the injured eye under the best possible condition, regardless of when the ocular wall would close.

Possible measures to implement on a first contact include: anti-tetanus vaccination, placement of a rigid eye protector, oral administration of analgesics and antiemetics, semifowler position and systemic administration of antibiotics, such as cefazolin, vancomycin or fourth generation fluoroquinolones[26].

In war-like scenarios, where the injured person's location can delay the care of open-globe trauma, Weichel et al.[27] have informed about a management protocol to improve the condition of the traumatised eye, including systemic and topical antibiotics from the moment of the lesion to 7 to 10 days. It has been reported that delaying the removal of an intra-ocular foreign body[28] or a vitrectomy[29] does modify visual prognosis, so long as the initial therapeutic measures help reduce the incidence of complications that deteriorate the injured eye.

In an ideal situation, an ophthalmologist would assess the patient with open-globe trauma as soon as possible. Initial measures and prompt referral supplement each other in order to reach a favourable surgical result.

Conclusions

The distribution of OTS categories 1-3 in eyes with open-globe trauma treated before and after 24 hours did not show significant differences that may contribute to a visual result, in addition to late treatment.

Conflict of interest

The authors declare that there are no conflicts of interest.

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