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Title

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Clinical Features of Orbital and Ocular Gunshot Wounds

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Introduction:

Ocular trauma is a leading cause of blindness in the United States. There have been studies of ocular trauma and penetrating injury, but few examining visual outcomes following gun related trauma to orbital and ocular structures. Furthermore, associations related to this type of trauma and visual outcomes has not been extensively studied.

Study Goals:

The aim of this study is to examine what factors of gun related trauma are predictive or associated with visual outcomes. For example, we will look at factors such as the ocular trauma score. The hope is to create a classification system that would allow objective assessment for both clinical prognosis and interventional studies.

Experimental Design:

The design of the experiment was retrospective cohort study at a single academic center.

- Included patients who had gun related trauma to the head and ocular area from 01/2010 to 09/2020, and they had an ophthalmology consult
- Abstracted data from EMR, such as demographics, visual acuity, and features of the Ocular Trauma Score (OTS)
- Calculated OTS and estimated probability of follow up visual acuity (Table 1-2).
- Excluded patients that did not survive or had enucleations
- Primary outcome = visual acuity change

Results:

There was a very small sample size, but we were able to extract some limited information on the population characteristics and visual outcomes.

Table 1. Computational method for deriving the OTS score

Initial visual factor	Raw points
A. Initial raw score (based on initial visual acuity)	NPL = 60 PL or HM = 70 1/200 to 19/200 = 80 20/200 to 20/50 = 90 ≥ 20/40 = 100
B. Globe rupture	-23
C. Endophthalmitis	-17
D. Perforating injury	-14
E. Retinal detachment	-11
F. Relative afferent pupillary defect (RAPD)	-10
Raw score sum = sum of raw points	

Table 1. Ocular Trauma Score used to predict visual outcomes after ocular trauma.

Table 2. Estimated probability of follow-up visual acuity category at 6 months

Raw score sum	OTS score	NPL	PL/HM	1/200-19/200	20/200 to 20/50	≥ 20/40
0-44	1	73%	17%	7%	2%	1%
45-65	2	28%	26%	18%	13%	15%
66-80	3	2%	11%	15%	28%	44%
81-91	4	1%	2%	2%	21%	74%
92-100	5	0%	1%	2%	5%	92%

NPL: nil perception of light; PL: perception of light; HM: hand movements

Table 2. Estimated probability of follow up visual acuity based on OTS.

Sample Characteristics	n
Patients who had gunshot related ocular injury	85
Deceased	13
Ophthalmology Consults	12
No ophthalmology Consults	55
Enucleation	3
Mean OTS Score	53.11
Median OTS Score	43

Table 3. Student survey on their desire to incorporate addition ultrasound education in the preclinical years.

Conclusions:

- OTS can be used to predict visual outcomes related to gun injury
- Gun-related trauma to the eye usually results in poor visual outcomes
- OTS average of 53 correlates to a 28% probability of NPL and 26% probability of PL/HM.
- Qualitatively, the limited data suggests that patients have little improvement or permanent vision loss after gun-related injury.
- In cases that there is gun-related injury to the surrounding ocular structures, ophthalmology is rarely consulted. Neurosurgery, ENT, and Trauma Surgery are likely to be consulted instead.

Limitations:

- Very small sample size (n=12).
- Many patients did not survive a gunshot wound to the ocular area/head, making it difficult to obtain a larger sample size.
- Few patients returned for follow up, giving limited information on visual outcomes
- Due to time restrictions, we could not do a complete statistical analysis.

Future Goals:

- Increase the sample size of the data by including more academic centers.
- Broaden ocular trauma to include other, less lethal, causes.
- Do a more thorough analysis using logmar to track visual acuity changes more objective.
- Look for patients with longer follow up.

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