Contextual and Clinical Characteristics of Traumatic Ocular and Open Globe Injuries in a Rural Population

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Introduction

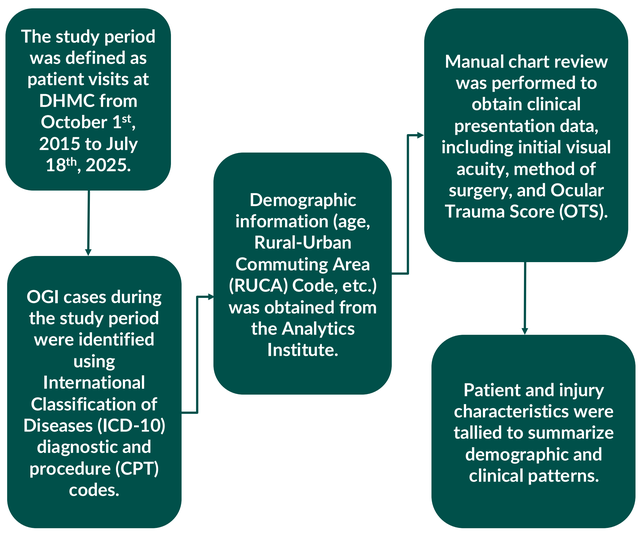
Ocular trauma ranges from minor to severe injuries. Open globe injury (OGI) is a type of ocular trauma that results in full-thickness injury to the eye wall. There is notable heterogeneity in the injury mechanisms of OGIs between groups with different contextual characteristics. For instance, studies comparing gender differences in OGI patterns have found that women experience more fall-related injuries, while men are more likely to be injured due to penetration and work-related activities.[1]

Rurality is another factor that may influence OGI presentation, as it poses challenges to accessing ophthalmic care as a whole; however, there is limited literature on its impact.[2] Here, we hope to investigate ocular trauma including OGI presentations at Dartmouth Hitchcock Medical Center (DHMC), a major tertiary referral center located in rural New Hampshire.

Study Aim

To describe the etiologies, patient demographics, and presenting findings of ocular trauma including OGI at DHMC, and to assess how rurality influences these characteristics.

Procedure & Methods



Baseline Characteristics	N (%)
Age (Mean ± SD)	48.1 ± 21.4
Sex	
Male	387 (77.7)
Female	110 (22.1)
Ethnicity	
Not Hispanic nor Latino	478 (95.9)
Hispanic or Latino	9 (1.8)
Race	
White	472 (94.8)
Black or African American	5 (1.0)
Asian	5 (1.0)
Hawaiian or Pacific Islander	1 (0.2)
Native American or Alaskan Native	2 (0.4)
RUCA Code	
Small Town/Isolated Rural	254 (51)
Large Rural Town	166 (33.3)
Suburban	14 (2.8)
Urban Core	63 (50.6)
Insurance	
Medicare	126 (25.3)
Medicaid	76 (15.3)
Commercial/Private	222 (44.6)
Worker's Compensation	21 (4.2)
Government Other	12 (2.4)

Table 1. Baseline characteristics of 498 patients identified using ICD-10 diagnosis codes for ocular trauma and open globe injury per the IRB-approved study protocol.

Preliminary Detailed Analysis of OGI Clinical Characteristics, N (%)	
Laterality	
Right Eye (OD)	11 (61.1)
Left Eye (OS)	7 (38.9)
Mechanism of Injury	
Construction	2 (11.1)
Assault	1 (5.6)
Road Traffic Accident	2 (11.1)
Fall	4 (22.2)
Other	9 (50)
Type of injury	
Laceration	9 (50)
Rupture	9 (50)
Intraocular Foreign Body	
Present	3 (16.7)
Absent	15 (83.3)
Time from Initial Presentation to Surgery (Hours)	
<24	15 (83.3)
24-48	2 (11.1)
48-72	0 (0)
>72	1 (5.6)
Substance Use During Injury	
Yes	2 (11.1)
No	12 (66.7)
Unspecified	4 (22.2)
Eye Protection Use During Injury	
Yes	1 (5.6)
No	16 (88.8)
Unspecified	1 (5.6)

Table 2. Clinical characteristics of 18 patients selected from the 498-patient cohort. This preliminary sample was reviewed to evaluate data quality and explore early injury trends.

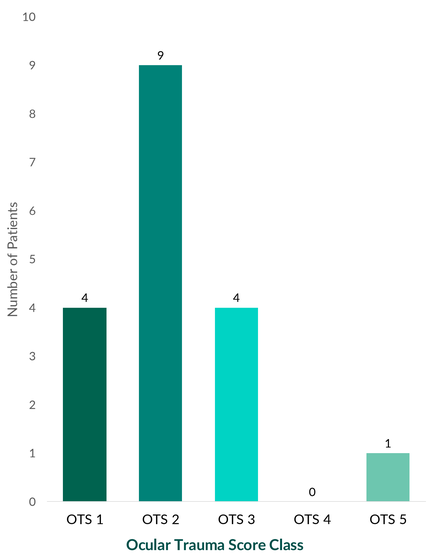


Figure 1. Distribution of Ocular Trauma Score (OTS) classes, which estimate visual prognosis after open globe injury (lower class = more severe injury). Most patients presented with Class 2 (50%), followed by Classes 1 and 3 (22% each), and Class 5 (6%).

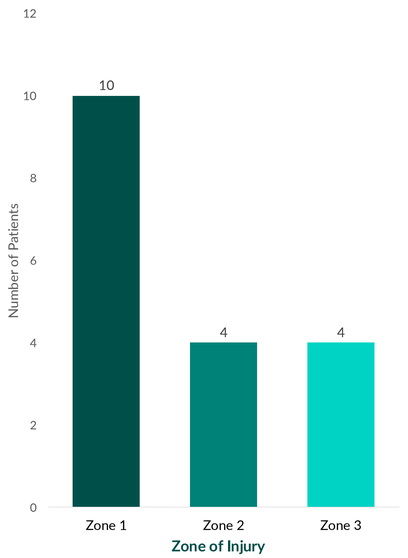


Figure 2. Distribution of open globe injury zones: Zone 1 (cornea/limbus), Zone 2 (anterior sclera within 5 mm of limbus), and Zone 3 (posterior sclera > 5 mm from limbus), with most injuries involving Zone 1 (56%).

Results

- Patients were identified by querying ICD-10 and CPT codes (e.g., CPT codes 65280, 65285, 65235, and 65265) as specified in the IRB protocol. The resulting cases were then sorted by medical record number, and the first 18 cases were selected in consecutive order for chart review to characterize early clinical patterns.
  - Half the injuries in this sample resulted from other mechanisms (9/18), followed by falls (4/18), road traffic accidents (2/18), construction (2/18), and assault (1/18).
  - Intraocular foreign bodies were present in 3/18 of cases.
  - OTS Class 2 (9/18) classification and anterior Zone 1 (10/18) injuries were most common.
  - 2/18 injuries involved substance use. 1/18 of patients used eye protection at the time of their injury.

Conclusions

- Most patients presenting to DHMC with ocular trauma in our cohort were White, not Hispanic nor Latino, and male, which likely reflects the underlying population of our catchment area.
- About 84% of patients were from small town/isolated rural areas or large rural towns, illustrating the rural nature of our study population.
- Falls and miscellaneous mechanisms are leading causes of traumatic ocular injury in this cohort, suggesting prevention efforts should address a broad range of injury types, not only high-profile causes like vehicle accidents or workplace injuries.
- Most open globe injuries in our cohort involved the right eye and were anterior (Zone 1) injuries of moderate severity (OTS Class 2), meaning they have a relatively guarded but potentially recoverable visual prognosis. This highlights the critical role of timely intervention in preserving vision.
- Eye protection was rarely used, and a subset of injuries involved substance use. These findings suggest that ocular trauma prevention must extend beyond occupational settings to address everyday risks, encourage consistent eye protection, and consider behavioral factors such as substance use.

Next Steps

1. Investigate differences in ocular trauma and OGI presentation across subgroups of RUCA categories (i.e., Large Rural Town versus Small Town/Isolated Rural).
2. Further evaluate patterns in the etiologies of OGI at DHMC.
3. Assess how insurance type and socioeconomic status may influence OGI presentation.

References

1. Emami-Naeini, P. (2013). Gender Disparities in Open Globe Injuries: Ten-Year Review of an Urban Population. *British Journal of Medicine and Medical Research*, *3*(4), 1380–1387.
2. Rodrigues, I. A., Symes, R. J., Stephen, T., & Stephen, R. (2017). Characteristics and outcomes of open globe trauma in the urban and rural populations. *Ophthalmic and Physiological Optics*, *37*(6), 679–685.