



# Scope of Ophthalmic Management in Patients with Head and Neck Trauma Secondary to Firearms



Michael Nguyen, BS, Vincent D. Tang, MD, Matthew A. De Niar, MD, PhD, Lily K. Lin, MD

## Background

Firearm-related injury remains a major public health issue in the United States, with a 25.2 times higher gun-related homicide rate than other affluent countries<sup>1</sup>. Injuries pertaining to the head and face are associated with significant morbidity. Although firearm injury occurs less frequently than other causes of ocular trauma, firearm-associated ocular injuries are often associated with poor visual outcomes<sup>2</sup>. Few studies have examined the frequency or patterns of ocular injury secondary to firearm-related trauma to the head and neck. In this study, we sought to describe the utilization of specialized ophthalmic evaluation for firearm injuries of the head and neck.

## Methods

207 patients seen at UC Davis Medical Center with head and neck injuries secondary to firearms between January 1<sup>st</sup>, 2010, and September 30<sup>th</sup>, 2020, were identified that met the inclusion criteria. Demographic, ophthalmic examination, surgical, and outcome data was collected for all cases. Non-parametric analyses and post hoc comparisons were performed.

## Results

### Percentages of patients with firearm injury to the head and neck

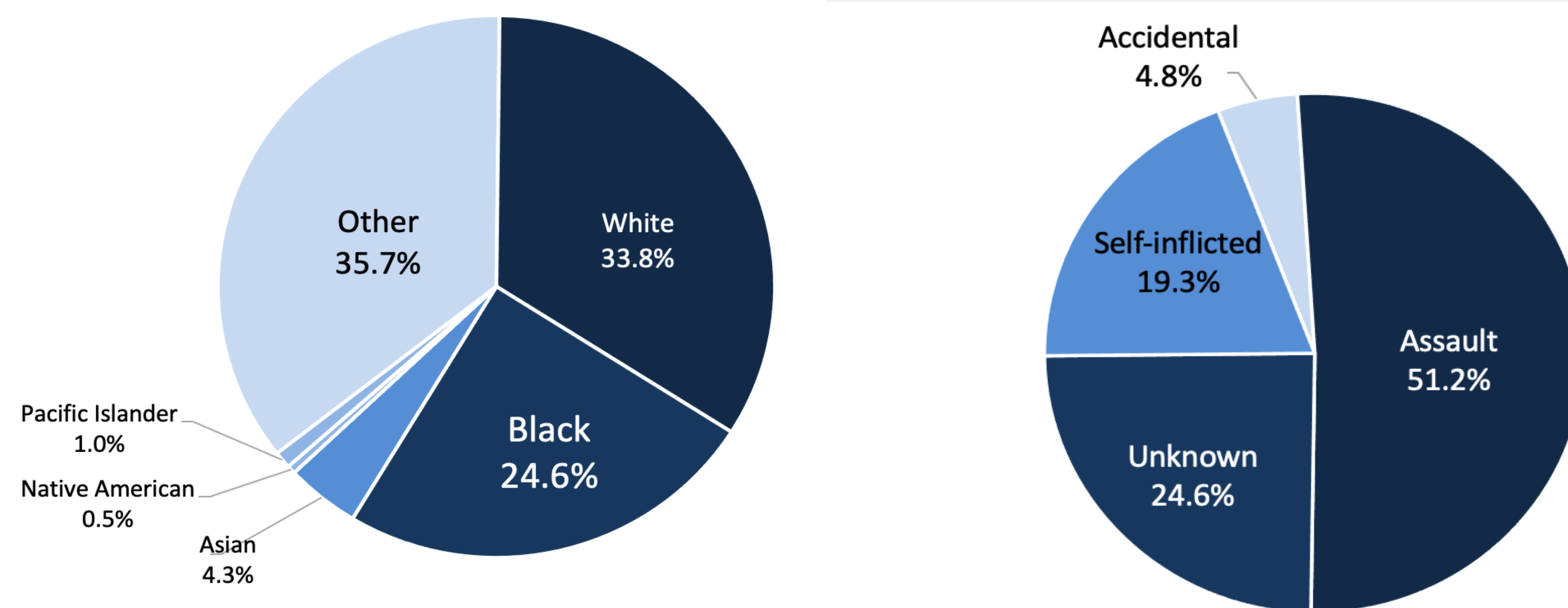


Figure 1. Photograph demonstrates a ruptured right globe from a handgun injury.

### Percent of patients for whom a specialty service was consulted

Ophthalmology	Neurologic Surgery	Plastic Surgery	ENT	Facial Trauma Service	Vascular Surgery	Orthopedic Surgery
29.0%	49.3%	26.1%	57%	71.5%*	5.3%	14.5%

### Patients with Orbital Fractures

	Evaluated by Ophthalmology	Detected Open-Globe Injury
n (%)	52 (76.5%)	20 (29.4%)
$\chi^2$	110.93	37.62
p-value	<0.001	<0.001
$\phi$	0.732	0.426

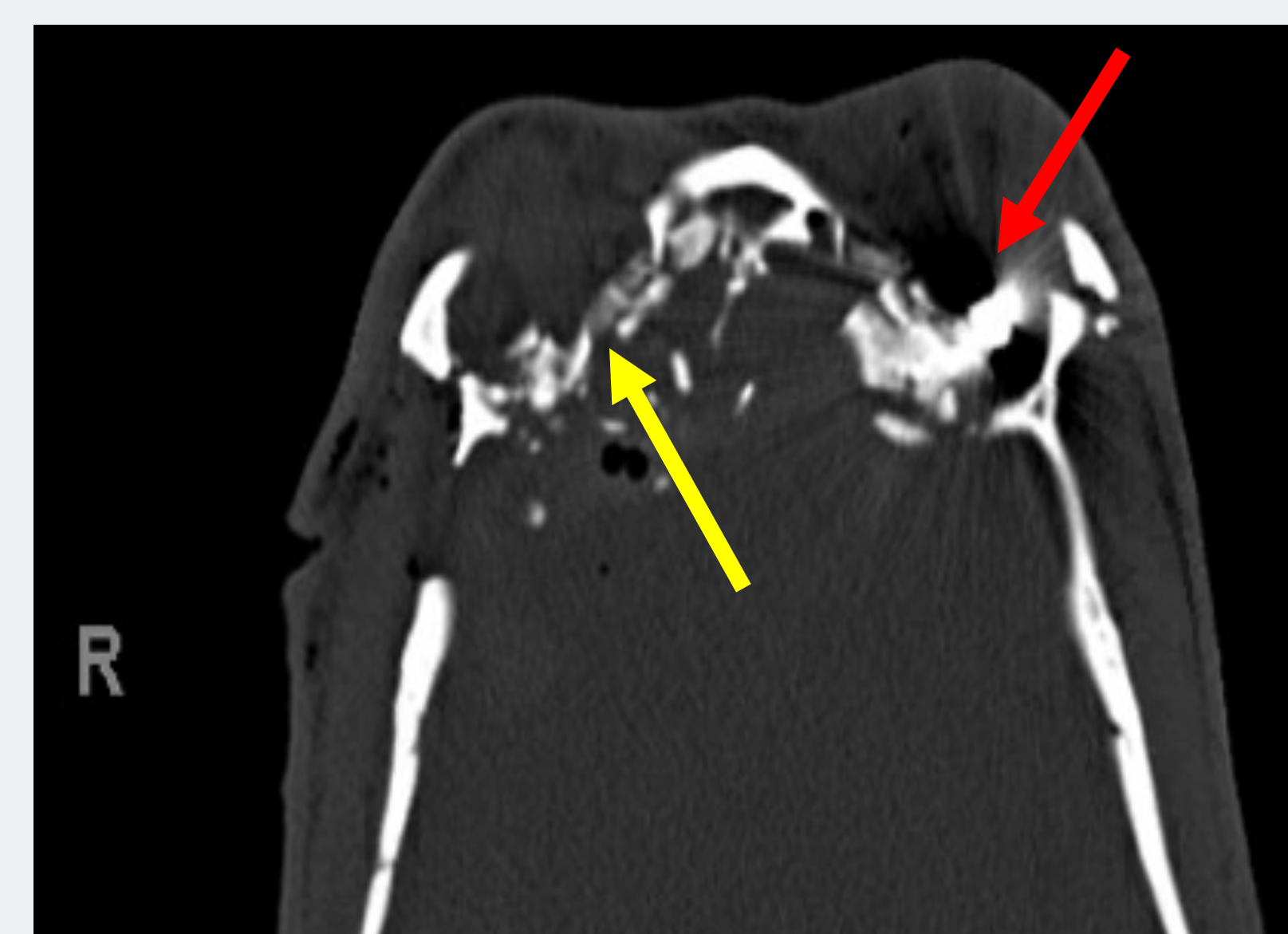
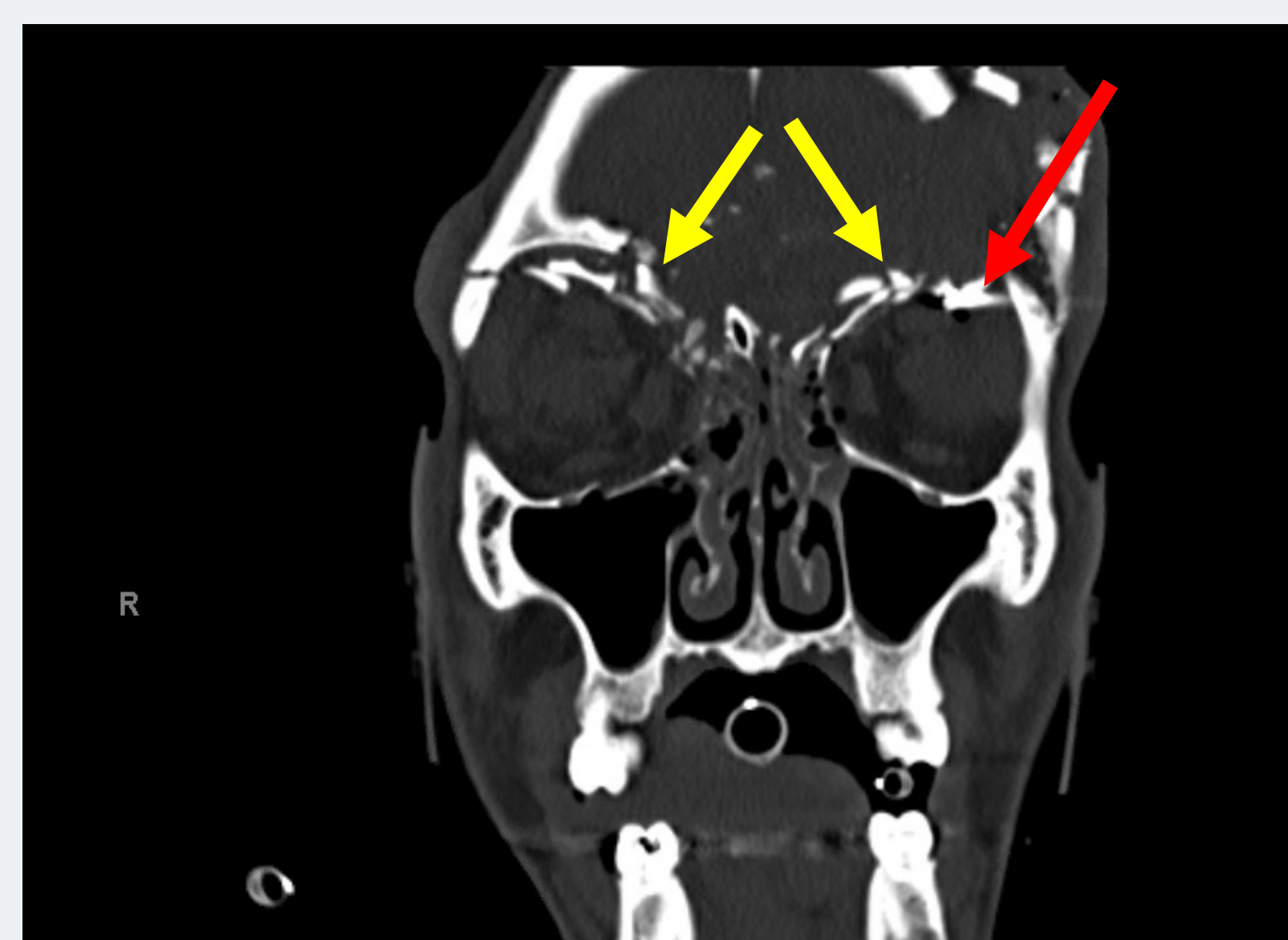


Figure 2. Frontal (left) and coronal (right) CT scans of the head demonstrate comminuted fractures (yellow arrows) through the anterior skull base and front bones extending to the orbit due to a penetrating bullet injury (red arrows).

## Conclusions

Firearm-related injuries of the head and neck frequently involve ocular and orbital structures, often causing vision-threatening injuries. Multispecialty management is common, and ophthalmologists are frequently involved in the evaluation of these injuries. Further, we believe that the large amount of force required to fracture a bone during injury may generate enough energy extending to the incompressible globe, causing blunt globe rupture and significant ocular damage. We suggest that specialized ophthalmic evaluation be requested for all patients with orbital fractures secondary to firearms due to the association with open-globe injury, likely via high-energy transfer from forceful impact.

## Acknowledgments

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## References

1. Grinshteyn E, Hemenway D. Violent death rates: the US compared with other high-income OECD countries, 2010. *The American journal of medicine*. 2016;129(3):266-273.
2. Erickson BP, Feng PW, Ko MJ, Modi YS, Johnson TE. Gun-related eye injuries: A primer. *Survey of Ophthalmology*. 2020;65(1):67-78.