

# Orbital Fracture Mechanisms - Lankenau Medical Center: A retrospective cohort study.



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## Abstract

**Objective:** To evaluate the incidence and mechanisms of action of orbital fractures in adults at Lankenau Medical Center during 2019 and 2020 to determine if there is an increase in orbital fractures related to domestic violence.

**Patients and methods:** A review was conducted on electronic medical records of all adults with a diagnosis of orbital fracture between 2019 and 2020 (n = 154 for 2019, and n = 31 for 2020). An analysis was performed on the incidence of orbital fractures in the setting of traumatic mechanisms of action, including motor vehicle accidents (MVA), fall, and assault including assaults in the setting of domestic violence.

**Results:** The study included 185 cases of orbital fracture documented on initial CT of facial bones. 62.9% in 2019 and 35.4 % in 2020 presented with orbital fracture secondary to fall, 6.4% in 2019 and 12.9% in 2020 presented with orbital fracture secondary to motor vehicle accident, 26.6% in 2019 and 35.4 % in 2020 presented with orbital fracture secondary to non domestic violence assault, 2.5% in 2019 and 3.2% in 2020 presented with orbital fracture secondary to unclear or unidentified etiologies, and finally 1.2% in 2019 and 12.9% in 2020 presented with orbital fracture secondary to domestic violence assault.

**Conclusions** Orbital fracture in adults are most commonly a result of falls. Our data suggests an increase in orbital fractures secondary to domestic violence assaults in 2020 versus 2019. However, further study with inclusion of orbital fracture data from multiple trauma centers in the Philadelphia area is warranted.

**Keywords:** orbital fracture, fall, assault, domestic violence.

## Introduction

An orbital fracture is defined as a break in one of the bones surrounding the orbit. The roof, floor, medial and lateral walls delineate the orbit (1). When the orbital floor is involved exclusively, this is often referred to as a pure blowout fracture. Although in most cases, the orbital floor is fractured in conjunction with the inferior orbital rim, and described as an impure blowout fracture (1). Common to orbital fractures however are their etiology. Almost exclusively, all orbital fractures are caused by blunt force trauma, when the orbit encounters significant force (1). This blunt force trauma could be secondary to an MVA, a fall, an assault including assaults in domestic violence settings.

Common signs and symptoms of orbital floor fractures include (but are not limited to) localized pain, periorbital ecchymosis, eyelid edema, subconjunctival hemorrhage, sensory deficits in the inferior orbital nerve distribution, displacement of the eye and restriction in the ocular eye movement resulting in undesirable diplopia. Diagnosis is made via careful ocular exam with attention to orbital signs; however, coronal and sagittal computed tomographic scanning provides an important adjunct to the ophthalmic exam as it displays the most reliable information on the size of the defect, the status of the globe and extraocular muscles, including evidence of entrapment. The posterior displacement of the globe within the orbit known as enophthalmos, compartment syndrome, in addition to muscle and nerve entrapment are a few of the serious complications that can arise secondary to an orbital fracture. In most cases of orbital fractures, treatment consists of careful observation, however, surgical intervention may be indicated in cases where visual impairment, diplopia in primary gaze, and damage to orbital structure are likely (1).

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## Methods and Materials

This is a retrospective study, examining orbital fracture cases at Lankenau Medical Center to determine if there is a rise in orbital fractures secondary to domestic violence in 2020 compared to 2019. All cases of orbital fractures seen at Lankenau medical center, a level 2 trauma center, within the electronic medical record system database were identified between 2019 and 2020.

Orbital fracture cases were selected based on history and ocular exams. Diagnosis were confirmed by CT scan findings. We stratified the mechanism of orbital fracture cases based on 4 categories:

1. Fall
2. Motor vehicle Accident(MVA)
3. Assault (Non domestic violence)
4. Domestic Violence Assault
5. Other (Unclear or unverified etiologies)

## Results

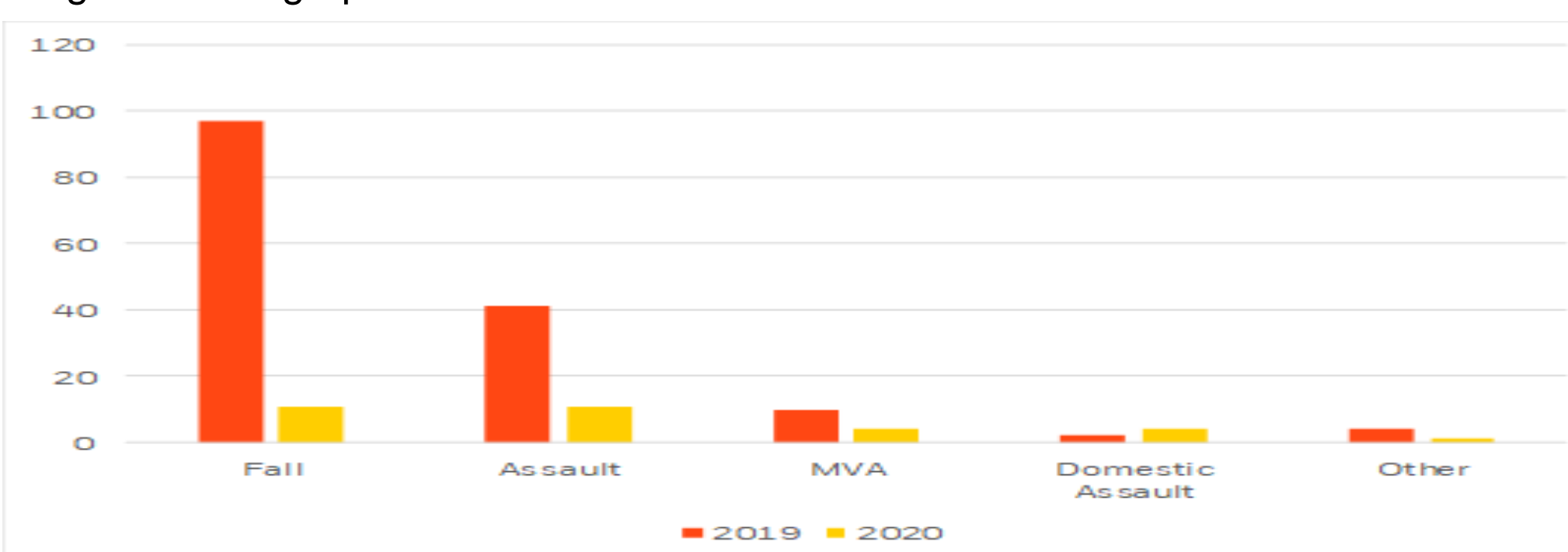
Table 1: Summary of all orbital fracture mechanism from 2019 - 2020

| Mechanism        | 2019 | %    | 2020 | %    |
|------------------|------|------|------|------|
| Fall             | 97   | 62.9 | 11   | 35.4 |
| Assault          | 41   | 26.6 | 11   | 35.4 |
| MVA              | 10   | 6.4  | 4    | 12.9 |
| Domestic Assault | 2    | 1.2  | 4    | 12.9 |
| Other            | 4    | 2.5  | 1    | 3.2  |
| Total            | 154  |      | 31   |      |

Table 2: Summary of all orbital fracture by domestic violence assault from 2019 - 2020

| Mechanism        | 2019 | %   | 2020 | %    | % Δ  |
|------------------|------|-----|------|------|------|
| Domestic Assault | 2    | 1.2 | 4    | 12.9 | 11.7 |

Figure 1. Bar graph illustration of data from 2019 to 2020



## Discussion

185 total orbital fractures in 185 patients documented on initial CT of facial bones were included in the study. Within our study timeframe, 154 total orbital fractures occurred in 2019 and 31 orbital fractures occurred in 2020. Of the 154 total orbital fractures that occurred in 2019, 97 cases (62.9%) and 41 cases (26.6%) were Fall and Assault related injuries respectively. 10 cases (6.4%) and 2 cases (1.2%) were MVA and Domestic violence related injuries respectively and 4 cases (2.5%) were through unclear or unverified etiologies.

Of the 31 total orbital fractures that occurred in 2020, 11 cases (35.4%) each were Fall and Assault related injuries respectively. 4 cases (12.9%) each were MVA and Domestic violence related injuries respectively and a single case (3.2%) was through unclear or unverified etiology.

## Conclusions

Recent studies have shown an increase in domestic violence during the COVID-19 lockdown period (2)(3).

During the course of our study, our data revealed an overall decrease in the total number of orbital fracture cases from 2019 - 2020 (Table 1). Remarkably, although most cases of domestic violence in the general public are unreported (4), in 2020, our data revealed an 11.7 % increase in orbital fractures through domestic violence assaults (Table. 2). Could this observed increase in 2020 be related to covid-19 restrictions?

It is not unreasonable to hypothesize that quarantining at home and the inability of these patients to leave a dangerous or difficult situation may have led to an increase in domestic violence assaults that resulted in these orbital fractures (2)(3). However, our study was limited by the challenges of differentiating cause and effect, variation in cohorts and the documented drastic decline in emergency room visits during the COVID-19 lockdown period (5). Hence, further study with inclusion of orbital fracture data from multiple trauma centers in the Philadelphia area is warranted.

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