

Refining Operative Indications for Zygomaticomaxillary Complex Fracture Repair

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Introduction

- The zygomaticomaxillary complex (ZMC) is the keystone of the midface.
- Although ZMC fractures are among the most common facial injuries, the optimal indications for repair remain controversial.
- Clinical symptomatology** of ZMC fractures commonly include: malar flattening, facial asymmetry, appreciable displacement, palpable step-off, malocclusion (misaligned teeth), trismus (limited range of motion in the jaw), paresthesias, diplopia, and enophthalmos.
- The **primary aim** of this study is to identify specific pre-operative radiographic findings that relate to injury-specific symptomatology in patients with ZMC fractures.

Methods

- Retrospective analysis** of patients with ZMC fractures seen at a Level I Trauma Center between 2015 and 2020.
- Exclusion criteria:** patients with additional midfacial fractures beyond the zygoma.
- Variables recorded from the medical record:** patient demographics, CT characteristics (degree of anatomic displacement), and symptoms indicating surgical intervention.
- Logistic regression analyses elucidated relationships between impaction measurements on CT imaging and symptomatology necessitating surgery.

Impaction Measurements

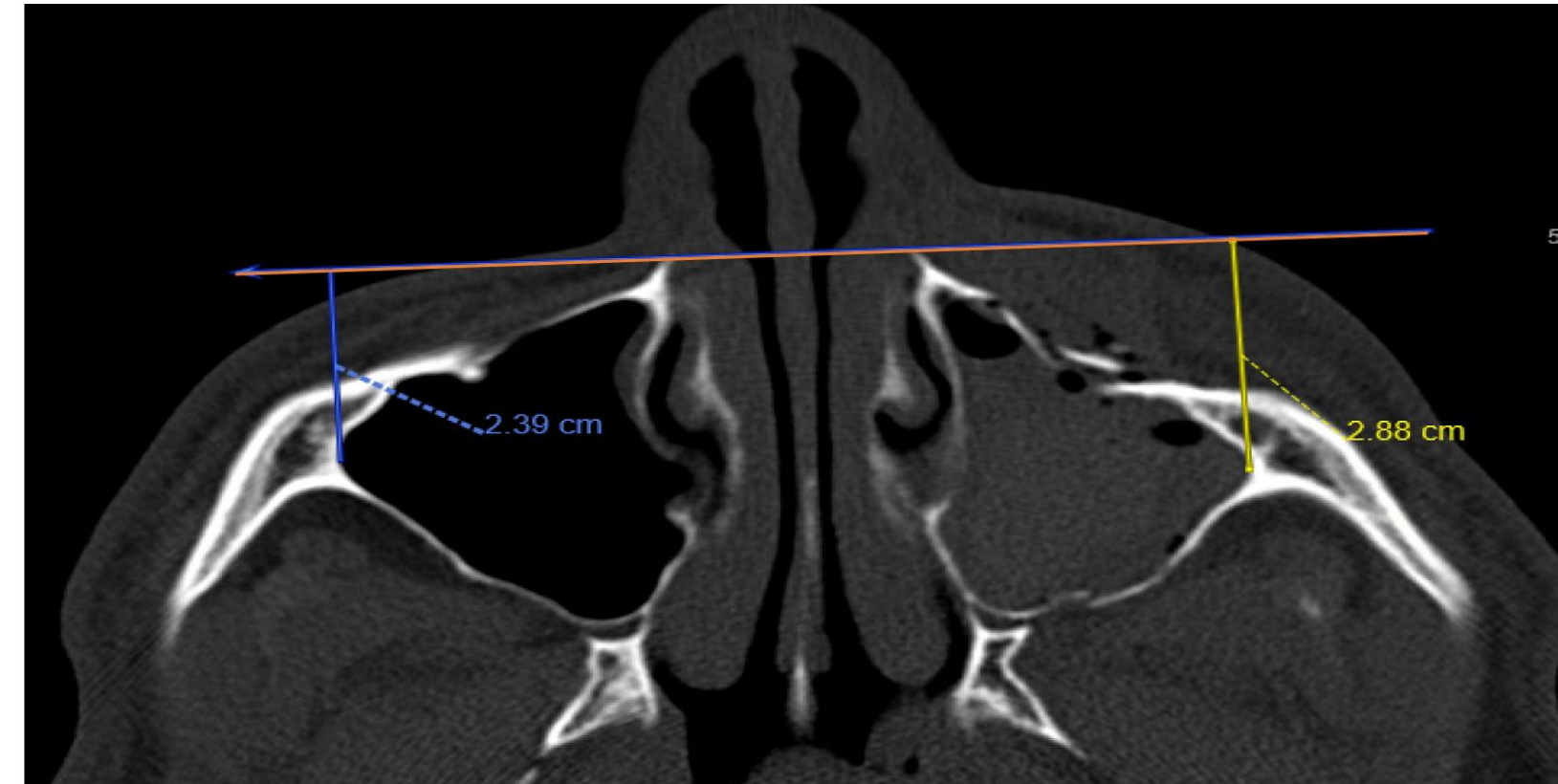


Figure 1. Anterior-posterior displacement, calculated as difference between the unaffected (blue) and fractured (yellow) sides



Figure 3. Maxillary wall impaction, fractured side (yellow)

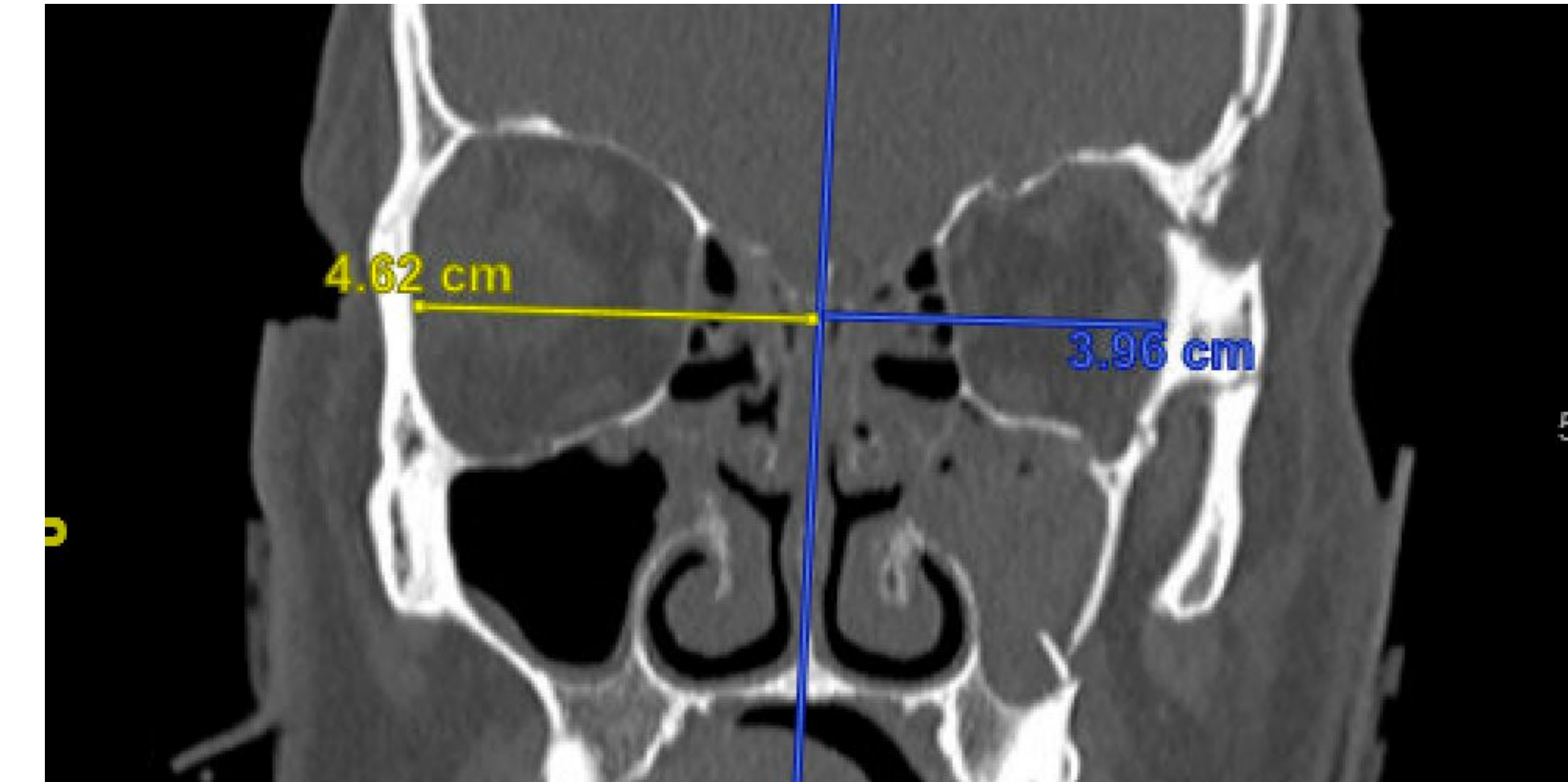


Figure 2. Lateral-medial displacement, calculated as difference between the unaffected (yellow) and fractured (blue) sides

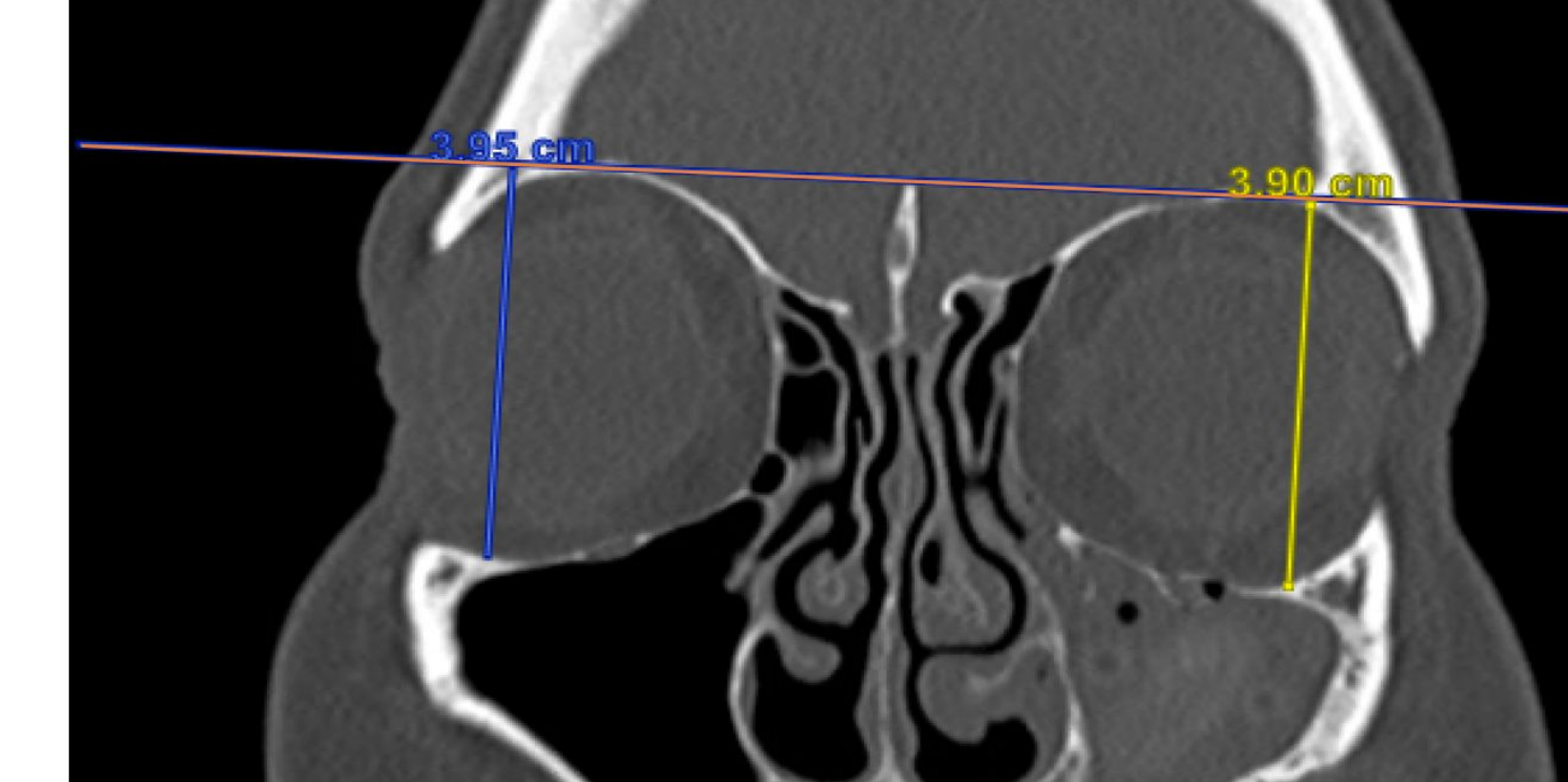


Figure 4. Vertical displacement, calculated as difference between the unaffected (blue) and fractured (yellow) sides

Note: Images taken from multiple patients with ZMC fractures.

Table 1. Relationship between common symptomatology and CT characteristics of zygomaticomaxillary complex fractures

Symptom	CT Characteristic	OR*	CI (2.5-97.5%)	p-value
Malar flattening or asymmetry	Maxillary wall impaction	21.9	4.7-132.6	0.0002
	Anterior-posterior displacement	5.5	1.5-22.2	0.0122
	Lateral-medial displacement	0.5	0.1-2.6	0.4258
Obvious displacement	Maxillary wall impaction	7.9	2.0-36.7	0.0049
Malocclusion	Vertical displacement	48.2	1.8-2022.0	0.029
Trismus	Vertical displacement	2.1	0.2-31.3	0.568

*For every one-unit increase in CT characteristic (e.g., maxillary wall impaction), the odds of symptom presentation (e.g., malar flattening) increases according to OR value (e.g., 21.9-fold)

Results

- 95 patients with ZMC fractures were included. 31% (n=29) presented with facial asymmetry or malar flattening, 17% (n=16) with trismus, 28% (n=27) with step-off, and 11% (n=10) with malocclusion.
- Presentation of **malar flattening** was significantly predicted by maxillary wall impaction and anterior-posterior fracture displacement. 76% (n=22) of patients with malar flattening were deemed operative.
- Maxillary wall impaction on CT also significantly predicted appearance of **step-off**. 56% (n=15) of patients with step-off were deemed operative.
- Vertical displacement most strongly predicted **malocclusion**. 40% (n=4) of patients with malocclusion were deemed operative.

Conclusions

- Our **final regression model** demonstrates that certain CT characteristics of ZMC fractures reliably predict symptoms requiring surgery. These CT measures include: maxillary wall impaction, anterior-posterior displacement, and vertical displacement.
- These findings may be applied to informing patients with ZMC fractures of their risk for developing specific symptoms based on CT imaging of their injuries.
- Ultimately, understanding specific relationships between symptomatology and CT impaction measures may guide the development of a standard protocol for surgical management of ZMC fractures.

Acknowledgments

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