



# Zygomatic Arch Fracture with Coronoid Impingement and without Impingement with Coronoid Process Fracture: The Importance of the Radiologist

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## Abstract

Fractures of the Zygomaticomaxillary Complex (ZMC) are common injuries that may lead to loss of an aesthetically pleasing appearance and functional impairment. These fractures can affect mastication through impingement by a depressed zygomatic arch on the temporalis muscle and coronoid process of the mandible. We report the cases of two patients with ZMC fractures. The first individual had zygomatic arch fracture with coronoid impingement. The second patient had ZMC fracture with a synchronous fracture of the coronoid process. Despite the existence of a greater depression of the zygomatic arch in the second patient, only the first case had important trismus. Computed tomography demonstrates the mechanical reasons that explain this different behavior of the mandibular dynamics.

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**Keywords:** Zygoma; Zygomatic arch fracture; Coronoid impingement; Trismus; Facial trauma.

## Introduction

The zygomatic bone is a major contributor in maintaining normal facial width and prominence of the cheek. Zygomatic arch fractures are common injuries following blunt trauma, being present in 11% to 15% of patients with other concomitant facial fractures [1,2]. These fractures can affect mastication through impingement by a depressed zygomatic arch on the temporalis muscle and coronoid process of the mandible; this can result

in trismus and pain with mastication [3]. In these patients and urgent open reduction is indicated. Impingement is suspected clinically in the presence of trismus with limited mouth opening and is confirmed radiologically with Computed Tomography (CT) imaging [4]. Swelling and pain of the soft-tissues due to the fracture, could conceal any depression of the malar eminence, but also cause a false trismus of a non-mechanical nature. In



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addition, in some patients, trismus after zygomatic arch fractures can be seen due to temporal muscle spasm secondary to impingement of the displaced fractures on the muscle. It is also known that, when a muscle is stretched, the myotactic reflex can lead to sudden excitation of muscle spindles and reflex contraction of the large skeletal muscle fibers of the same muscle and closely allied synergistic muscle [5]. For these reasons, radiologists must carefully evaluate the relationships established between the depressed arch and the coronoid process.

This work aims to document two clinical cases in which computed tomography shows its important role in diagnosing the nature of the limitation of the opening of the mouth in patients with fractures of the zygomaticomaxillary complex.

### Case 1

A 75-year-old woman admitted to the emergency room after suffering a casual fall in her house's garden. The patient had a previous history of ischemic, cerebral and coronary pathology. Her usual medications included: Aspirin, clopidogrel, Atorvastatin, and bisoprolol for about three years. On physical examination, she presented a very limited oral opening (3 mm) as well as a periorbital hematoma and a significant depression of the left zygomatic arch. An urgent CT scan was performed in which the following findings were evident: Thickening of the left masseter muscle with intramuscular and subcutaneous air bubbles, left zygomatic arch fracture in two points (Figure 1). There were no signs of acute intracranial pathology. The patient was operated under general anesthesia 6 hours after admission, and a closed reduction of the zygomatic arch fracture was carried out using a Gillies approach. The oral opening in the immediate postoperative period was 40 mm. The patient was discharged 24 hours after surgery. At the one-month and six-month follow-up, clinically and radiologically, there were no alterations.

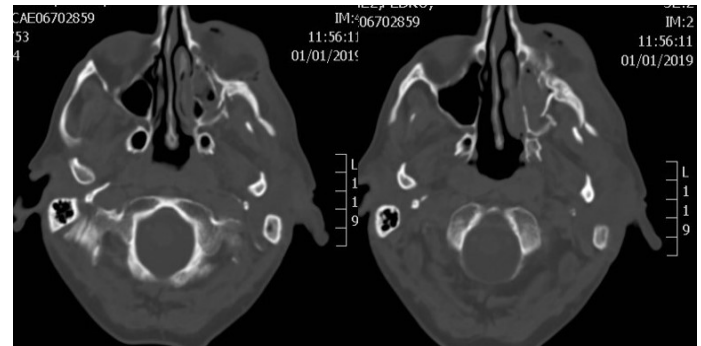
### Case 2



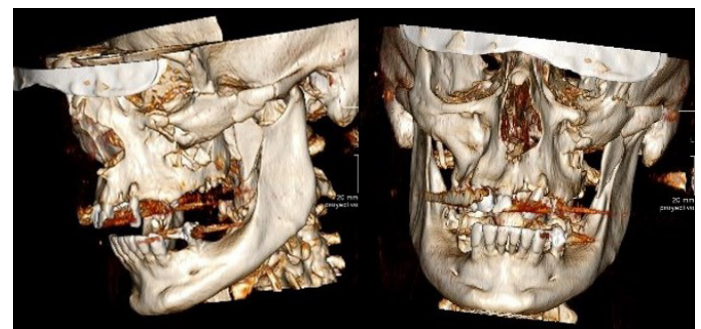
**Figure 1:** Axial CT. Left zygomatic arch fracture with impingement in a patient with severe limitation of the oral opening (3 mm).

54-year-old male admitted to the emergency room after suffering an assault. His personal history included: HIV positive, methadone treatment, hepatitis C, and Horton's headache. Upon admission, he presented: Limitation of the (36 mm) oral opening, erosion in the anthelix of the left ear and left periorbital edema. He did not present diplopia or loss of consciousness. The examination by the ophthalmologist did not show ocular pathology. An urgent CT scan was performed in which the existence of a malar fracture with significant depression of the zygomatic arch was observed (Figure 2a). He also presented fractures of the greater wing of the sphenoid, the external

wall of the orbit, the infraorbital rim and the left mandibular coronoid process (Figure 2b). Under general anesthesia the zygomatic fracture was reduced using a Keen and subciliary approach. The malar was fixed with 2 Matrix Midface miniplates, one in the left infraorbital rim and another L-shaped plate in the maxillo-malar buttress. Postoperative oral opening was 38 mm. The patient was discharged 24 hours after surgery, and was reviewed one month later showing no limitation in the oral opening. The patient did not attend the six-month control.



**Figure 2a:** Axial CT. High-energy zygomaticomaxillary complex fracture without impingement in a patient without limitation of the oral opening (36 mm).



**Figure 2b:** Three-dimensional imaging of high-energy zygomaticomaxillary complex with synchronous fracture of the coronoid process (submuscular) without limitation of the oral opening.

### Discussion

Isolated zygomatic arch fractures are common fractures in maxillofacial trauma. These fractures can trigger a functional alteration in the mouth opening and closing. However in the literature, works on the basic mechanism of clinical symptoms, are limited.

Mundinger et al [4], in their brief but interesting work, answer a question: What is the mechanism of coronoid impingement by zygomatic arch fractures? In the opinion of these authors, the CT should show direct bone-on-bone contact between the arch and coronoid process of the mandible, not fractured. This situation was presented by the first patient in our study, so clinically she had a severe limitation in the oral opening.

Coronoid fracture occurrence is rare (1.23–3.58% of all mandibular fractures and 0.85–2.9% of all maxillofacial fractures) and significantly related to zygomatic arch fracture [6]. Diagnosing coronoid process fractures only by clinical symptoms is very difficult. CT and panoramic radiographs are still the gold standard (or extremely valuable) procedures in the diagnosis of mandibular coronoid fracture. Classically, coronoid process fractures were divided into two types: Intramuscular (where

the fracture fragment is within the investing fascial attachment of the temporalis muscle) and submuscular (where the fracture is below the musculotendinous attachment) [7]. When the fracture is intramuscular, bone fragment displacement is minimal. Radiologically three types can be recognized: Coronoid process apex fracture, coronoid process fracture medial to the deepest central point of the sigmoid notch and coronoid process fracture lateral to the deepest central point of the sigmoid notch [8].

Zhou et al [9] analyzed the limitation of the oral opening in 963 patients with maxillofacial fractures in Wuhan University Hospital. In this study, patients who sustained coronoid fractures have the highest risk of serious limitation in mouth opening, followed by zygomatic arch fractures. Interestingly, in this study fracture of the zygomatic arch or condylar process resulted in the high occurrence of serious limitation in mouth opening, whereas the combined fracture of zygomatic arch and condylar process were more prone to normal or mild mouth opening. A similar observation was presented by patient number two in the present work, but what is the explanation for it? The CT gives us the answer: The fracture of the coronoid process eliminates the mechanical rigidity necessary for the production of the impingement. Different studies have reported that coronoid fractures are usually associated with zygomatic arch or complex fracture [10], considering that patients with zygomatic arch fractures had the highest risk of synchronous coronoid process fractures [11].

### Conclusion

In conclusion, the present study highlights that coronoid process fractures, frequently synchronized with high-energy ZMC fractures, may not present trismus. The imaging studies show that the limitation in oral opening is presented in function the degree of depression of the zygomatic arch when the coronoid process is intact.

### References

1. Wusiman P, Maimaitituexun B, Guli, Saimaiti A, Moming A. Epidemiology and Pattern of Oral and Maxillofacial Trauma. *J Craniofac Surg.* 2020; 31: e517-e520.
2. Brucoli M, Boffano P, Broccardo E, Benech A, Corre P, et al. The European zygomatic fracture research project: The epidemiological results from a multicenter European collaboration. *J Craniomaxillofac Surg.* 2019; 47: 616-621.
3. Valdés Reyes, JM, Zapata Ocampo S. Functional Classification of Isolated Zygomatic Arch Fracture. New Proposal. *J Craniofacial Surg.* 2020; 26.
4. Munding GS, Daniel M, Sacks JM. Zygomatic arch fracture with coronoid impingement. *Eplasty.* 2015; 22: 15: ic5.
5. Philip M, Sivarajasingam V, Shepherd J. Bilateral reflex fracture of the coronoid process of the mandible. A case report. *Int J Oral Maxillofac Surg.* 1999; 28: 195-196.
6. Kale TP, Aggarwal V, Kotrashetti SM, Lingaraj JB, Singh A. Mandibular coronoid fractures, how rare?. *J Contemp Dent Pract.* 2015; 16: 222-226.
7. Natvig P, Sicher H, Fodor PB. The rare isolated fracture of the coronoid process of the mandible. *Plast Reconstr Surg.* 1970; 46: 168-172.
8. Nardi C, Vignoli C, Pietragalla M, Tonelli P, Calistri L, et al. Imaging of mandibular fractures: A pictorial review. *Insights Imaging.* 2020; 11: 30.
9. Zhou HH, Lv K, Yang RT, Li Z, Yang XW, Li ZB. Clinical, retrospective case-control study on the mechanics of obstacle in mouth opening and malocclusion in patients with maxillofacial fractures. *Sci Rep.* 2018; 8: 7724.
10. Boffano P, Kommers SC, Rocca F, Gallesio C, Forouzanfar T. Fractures of the mandibular coronoid process: A two centres study. *J Craniomaxillofac Surg.* 2014; 42: 1352-1355.
11. Zhou HH, Lv K, Yang RT, Li Z, Li ZB. Risk factor analysis and idiographic features of mandibular coronoid fractures: A retrospective case-control study. *Sci Rep.* 2017; 7: 2208.