

# Use of Cone Beam Computed Tomography in the Assessment of Facial Trauma: Report of Two Cases

*Uso da Tomografia Computadorizada de Feixe Cônico na Avaliação de Trauma Facial: Relato de Dois Casos*  
*Uso de la Tomografía Computarizada de Haz Cónico en la Evaluación de Traumatismos Faciales: Reporte de Dos Casos*

Gabriel **ARAUJO-SILVA**  
Mestrando em Engenharia Biomédica, Centro de Engenharia, Modelagem e Ciências Sociais Aplicadas, Universidade Federal do ABC – UFABC  
09606-070 São Bernardo do Campo – SP, Brasil  
<https://orcid.org/0000-0003-2235-9519>

Cleiton Rone **SANTOS-LIMA**  
Mestrando em Odontologia, Departamento de Estomatologia, Faculdade de Odontologia, Universidade Federal de Goiás - UFG,  
74605-020 Goiânia - GO Brasil  
<https://orcid.org/0000-0003-3559-1472>

Guilherme Fantini **FERREIRA**  
Doutorando em Clínica Odontológica, Departamento de Prótese e Periodontia, Faculdade de Odontologia de Piracicaba,  
Universidade de Campinas - UNICAMP, 13414-903 Campinas – SP, Brasil  
<https://orcid.org/0000-0002-6449-9408>

Gabriel de Toledo **TELLES-ARAÚJO**  
Doutorando em Medicina e Saúde, Departamento de Medicina Preventiva e Social, Faculdade de Medicina, Universidade Federal da Bahia - UFBA  
40026-010 Salvador – BA, Brasil  
<https://orcid.org/0000-0002-9577-2008>

## Abstract

Imaging is an essential component in the treatment of facial trauma, as it provides support from diagnosis and treatment planning to the evaluation of results. Cone beam computed tomography (CBCT) enables a tridimensional assessment of anatomical structures. This study aims to evidence, through two case reports of the contribution of CBCT in the diagnosis of facial trauma. In both cases, patients were victims of facial trauma, one due to traffic accidents and the other by fall from height. No type of fracture was verified in emergency medical care. Professionals requested a CBCT exam to assist in the diagnosis of possible fractures. In CBCT images examination, it was possible to visualize foreign bodies in the maxillary region (Case 1), and the presence of mandible fracture (Case 2). The use of CBCT is crucial to obtain details on images that aid the diagnosis of fractures in cases of facial trauma. Even though it is not often used in emergency services, its use is well-indicated for more precise diagnosis.

**Descriptors:** Cone-Beam Computed Tomography; Diagnosis; Maxillofacial Injuries.

## Resumo

O exame por imagem é um componente essencial do tratamento de traumas faciais, pois fornece suporte desde o diagnóstico e o planejamento do tratamento até a avaliação dos resultados. A tomografia computadorizada de feixe cônico (TCFC) possibilita a avaliação das estruturas anatómicas de forma tridimensional. Este estudo tem como objetivo evidenciar, por meio de dois relatos de casos, a contribuição da TCFC no diagnóstico de traumas faciais. Em ambos os casos, os pacientes foram vítimas de trauma facial, um por acidente de trânsito e outro por queda de altura. Nenhum tipo de fratura foi verificado no atendimento médico de emergência. Os profissionais solicitaram o exame de TCFC para auxiliar no diagnóstico de possíveis fraturas. No exame de imagens de TCFC, foi possível visualizar corpos estranhos na região maxilar (Caso 1) e a presença de fratura de mandíbula (Caso 2). O uso da TCFC é fundamental para a obtenção de detalhes nas imagens que auxiliam o diagnóstico de fraturas em casos de trauma facial. Apesar de não ser muito utilizada em serviços de emergência, seu uso é bem indicado para um diagnóstico mais preciso.

**Descritores:** Tomografia Computadorizada de Feixe Cônico; Diagnóstico; Lesões Maxilofaciais.

## Resumen

El diagnóstico por imagen es un componente esencial en el tratamiento de los traumatismos faciales, ya que proporciona apoyo desde el diagnóstico y la planificación del tratamiento hasta la evaluación de los resultados. La tomografía computarizada de haz cónico (TCHC) permite la evaluación tridimensional de las estructuras anatómicas. El objetivo de este estudio es mostrar, a través de dos casos clínicos, la contribución de la TCHC en el diagnóstico de los traumatismos faciales. En ambos casos, los pacientes fueron víctimas de traumatismos faciales, uno debido a un accidente de tráfico y el otro a una caída de altura. Durante la atención médica de urgencia no se detectó ningún tipo de fractura. Los profesionales solicitaron un escáner TCHC para ayudar a diagnosticar posibles fracturas. Las imágenes TCHC mostraron cuerpos extraños en la región maxilar (caso 1) y la presencia de una fractura mandibular (caso 2). El uso de la TCHC es esencial para obtener detalles en las imágenes que ayuden a diagnosticar fracturas en casos de traumatismo facial. Aunque su uso no está muy extendido en los servicios de urgencias, su empleo está bien indicado para un diagnóstico más preciso.

**Descritores:** Tomografía Computadorizada de Haz Cónico; Diagnóstico; Lesiones Maxilofaciales.

## INTRODUCTION

Trauma is considered to be a set of disturbances caused suddenly by a physical agent of widely varying etiology, nature, and extent<sup>1</sup>. According to data from the World Health Organization, trauma is among the main causes of death and comorbidity in the world, with head and face injuries responsible for 50% of all these deaths<sup>1</sup>. The mandible and nose are the main sites of fractures, followed by the zygomatic<sup>1,2</sup>. The diagnosis and treatment of facial lesions involve multidisciplinary care, especially for maxillofacial trauma specialists<sup>1,3</sup>.

The radiographic exam is an essential component of facial trauma management, as it

provides support from diagnosis and treatment planning until results evaluation.<sup>4</sup> However, information obtained on conventional radiographs is limited to two-dimensional visualizations, such as intraoral and panoramic radiographs<sup>5</sup>. With evident technological evolution in dentistry and diagnostic imaging, more accurate tests have been used in evaluation of the bucomaxillofacial complex<sup>4,5</sup>.

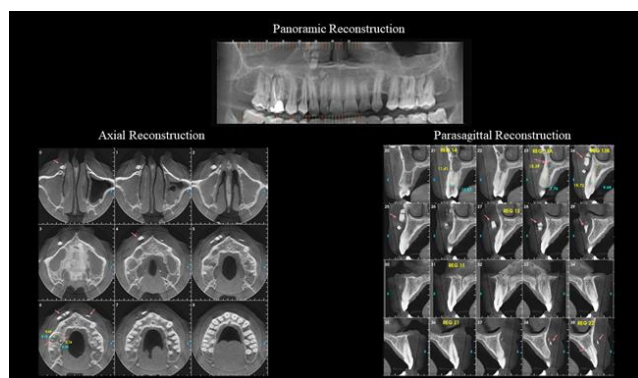
Cone-beam computed tomography (CBCT) has enabled the evaluation of anatomical structures in a tridimensional way, with greater accuracy and resolution than conventional radiographs<sup>5</sup>. CBCT is a volumetric technique with a tridimensional representation of structures, which provides axial, coronal, and sagittal sections, that can be the region

of the jaws, the middle third of the face, or the entire head<sup>6</sup>. This exam has become one of the pillars of oral and maxillofacial surgery, because, by offering the professionals multiplanar visualizations, it allows more accurate diagnosis and treatment, with a lower radiation dose when compared to conventional tomography (CT)<sup>7</sup>. Thus, this study aims to evidence, through two case reports, the contribution of CBCT in the diagnosis of facial trauma.

### CLINICAL CASE

#### o Case 1

A 37-year-old male patient, leukoderma, attended a public emergency service, a victim of a traffic accident, apparently presenting superficial injuries to the face. He was submitted to emergency procedures in the operating room, with a suture of facial injuries. Seven days later, the patient sought dental care, complaining of pain in the maxilla region. After clinical evaluation, CBCT was requested. On CBCT examination, homogeneous, delimited, and regular-shaped hyperdense images are observed, circumscribed by a hypodense halo, located in the anterior vestibular region of maxilla, corresponding to soft tissue (panoramic reconstruction and axial reconstruction number 0-6), right maxilla lateral incisor and canine teeth and left maxilla lateral incisor, suggestive of foreign body or vitreous fragment (parasagittal reconstructions number 24-29 and 37-39). There is a proximity relationship between the upper fragment in the right maxilla canine region and the distal wall of the nasal cavity (parasagittal reconstructions number 24-26). It is also possible to observe total opacification of the maxillary sinus on the right and partial side of the maxillary sinus on the left side (Figure 1).

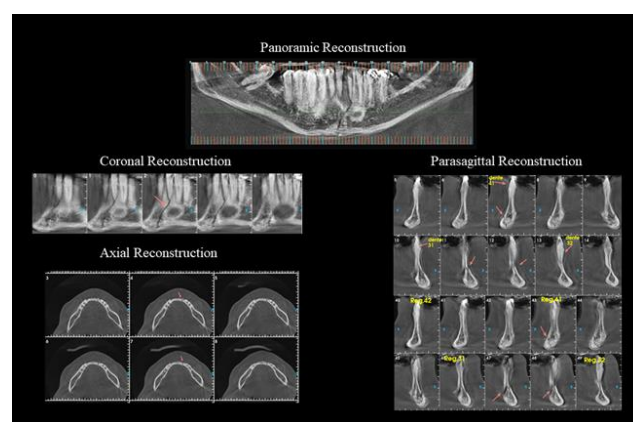


**Figure 1:** Multiplanar reconstructions (panoramic, axial, and parasagittal) evidencing the presence of fragments in the maxillary region.

#### o Case 2

A 63-year-old male patient, leukoderma, attended public emergency service, a victim of a fall while leaving the bus. As a result, he had several injuries to his face. At first, a CT image was performed, and no fracture was observed. Then, the

suture was carried out in the wound region. Three days after medical care, the patient attended the dental clinic complaining of severe pain in the left mandibular lateral incisor region. Clinical evaluation was done, followed by CBCT. On CBCT images it is possible to observe a radiolucent line, of well-defined limits, located in the mandible anterior region (panoramic reconstruction, axial reconstruction number 4-7, and coronal reconstruction number 1-3), extending in an upper-inferior direction from alveolar bone crest to the cortical bone of the mandible base and in the anteroposterior direction extending from the cortical buccal bone to cortical lingual one, suggestive of mandibular fracture (parasagittal reconstructions number 7-13 and 43-48) (Figure 2).



**Figure 2:** Multiplanar reconstructions (panoramic, coronal, axial and parasagittal) featuring image of mandibular fracture.

### DISCUSSION

Traumatic injuries are considered serious public health problems that have been a serious concern, since their incidence is increasing and they cause sequelae in patients<sup>2</sup>. Traffic accidents are reported in literature as the main cause of facial trauma, with prevalence in young men<sup>1,8,9,10</sup>, as presented in case 1. This condition may be related to changes in habits and social dynamics that require the use of motor vehicles<sup>8</sup>, as well as the lack of adequate structure of public roads, lack of supervision by the responsible agencies, recklessness of drivers, mainly related to ingestion of alcoholic beverages and impunity of offenders, reflecting lack of respect for traffic laws<sup>2</sup>.

Another very expressive etiological factor of facial trauma is a fall from height, which mainly affects elderly patients<sup>2,8</sup>. Case 2 corroborates this information since the patient is 63 years old and was the victim of a fall when disembarking from a bus. More severe repercussions on motor and sensory functions, such as postural control and balance, as well as a series of changes in body composition that occur with aging may contribute to more severe cases of facial trauma<sup>1,8</sup>.

Imaging diagnosis of facial trauma, especially in cases of fracture is a challenge, since routine tests such as panoramic radiography (in

dentistry) and CT (in medicine) may not show details of specific regions of fracture<sup>6</sup>. On the other hand, CBCT, most commonly used in dentistry, is indicated due to its accuracy in terms of location, extension, and displacement of bone fragments in three dimensions in cases of maxillofacial fractures<sup>6</sup>. Thus, this imaging examination becomes essential for a more reliable diagnosis of fractures in the face region, as evidenced by Case 2, in which conventional tomography did not reveal the mandibular fracture. It is noteworthy that the CBCT was performed in both cases and allowed the visualization of foreign bodies (Case 1) and fracture (Case 2), confirming the contribution of this imaging modality, associated with the clinical examination, in the diagnosis of facial trauma.

### CONCLUSION

Through the report of these two cases, it was concluded that the use of CBCT is essential to obtain details on images that help the diagnosis of fractures in cases of facial trauma. Even though it is rarely used in emergency services, its use is well indicated, and associated with clinical examination, for more accurate diagnoses.

### REFERENCES

1. Moura MTF, Daltro RM, Almeida TF. Traumas faciais: uma revisão sistemática da literatura. Rev Fac Odontol UPF. 2016;21(3):331-37.
2. Calheira MC, Carvalho FS, Carvalho CAP. Perfil epidemiológico do trauma facial em um hospital regional do interior da Bahia. Rev Ciênc Plural. 2021;7(2):88-106.
3. Einy S, Rahman NA, Siman-Tov M, Aizenbud D, Peleg K. Maxillofacial Trauma Following Road Accidents and Falls. J Craniofac Surg. 2016;27(4):857-61.
4. Alimohammadi R. Imaging of Dentoalveolar and Jaw Trauma. Radiol Clin North Am. 2018;56(1):105-24.
5. Gaêta-Araujo H, Alzoubi T, Vasconcelos KF, Orhan K, Pauwels R, Casselman JW, Jacobs R. Cone beam computed tomography in dentomaxillofacial radiology: a two-decade overview. Dentomaxillofac Radiol. 2020;49(8):20200145.
6. Salzedas LMP, Victorino IP, Pescinini-Salzedas LM, Coclete GEG, Silva WFT, Vieira JB, Coclete GA. Uso de tomografia computadorizada por feixe cônico no Serviço de Radiologia Odontológica da FOA-UNESP: recurso no diagnóstico de fraturas do complexo bucomaxilofacial. Arch Health Invest. 2015;4(2):17-24.
7. Weiss R, Read-Fuller A. Cone beam computed tomography in oral and maxillofacial surgery: An evidence-based review. Dent J. 2019;7(2):52.
8. Porto D, Cavalcanti YW, Forte FD. Maxillofacial trauma due to traffic accidents and falls: an exploratory study of associated factors. Med Oral Patol Oral Cir Bucal. 2021;26(3):349-56.
9. Neto ICP, Franco JMPL, Junior JLA, Santana MDR, Abreu LC, Bezerra ÍMP, et al. Factors Associated With the Complexity of Facial Trauma. J Craniofac Surg. 2018;29(6):562-66.
10. Ribeiro-Ribeiro AL, Gillet LCS, Vasconcelos HG, Rodrigues LC, Pinheiro JJV, Alves-Junior SM. Facial Fractures: Large Epidemiologic Survey in Northern Brazil Reveals Some Unique Characteristics. J Oral Maxillofac Surg. 2016;74(12):2480.e1-2480.e12.

### CONFLICT OF INTERESTS

The authors declare no conflict of interest.

### CORRESPONDING AUTHOR

#### Gabriel Araujo-Silva

Centro de Engenharia, Modelagem e Ciências Sociais Aplicadas  
Universidade Federal do ABC  
09606-070 São Bernardo do Campo – SP, Brasil  
Email: gabriel.araujos@yahoo.com

Received 17/05/2024

Accepted 26/05/2024