

Case report of fractured artifact in the mandibular region: A radiologist's challenge to diagnosis

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Abstract

An object or form that is considered an artifact was created artificially and is not often visible on the radiograph. Inadequate handling of the film, chemical contamination, and other factors are among the causes of flaws and artifacts, according to the literature. Because they can resemble diseases or can cover up the region of interest, it is crucial to correctly identify these. This article focuses on a radiolucent object seen on a routine dental radiograph that looks similar to a fracture line on the mandibular right side. We also cover the different sources of artifacts and place emphasis on correctly recognizing them so they aren't mistaken for pathology. This article examines the situation of a woman who appeared to be 28 years old, a radiolucent image on the patient's right side, extending from the coronoid process to the mandibular ramus. The radiolucent artifacts seen in the cephalometric and panoramic radiographic images, in this case, showed a discrepancy between the results on the right mandibular actual condition.

Keywords: Artifact; Cephalometric; Panoramic; Fracture; Dental Radiology

1. Introduction

The use of dental radiology in diagnostic and treatment planning is beneficial.^{1,2} It also helps to improve the quality of the treatment result by acting as a beneficial verification modality. Digital dental radiography is believed to be just as diagnostically accurate as traditional film-based radiography, but it has additional advantages such as faster processing and reduced radiation exposure for patients.²⁻⁶ Radiographic noise (unwanted fluctuations within an image that could result in incorrect diagnosis) can be suppressed and information can be improved in digital radiographic pictures. Commercial digital systems frequently include contrast, edge improvement procedures, magnification capabilities, and other enhancement elements to improve the clinician's diagnostic capacity. Contrary to popular belief, The physician cannot perfectly correlate radiographic diagnosis with clinical data using either traditional or digital radiography evaluation imaging modalities. A radiographic enhancing artifact that potentially results in incorrect diagnoses is described in this clinical case.¹⁻²

An x-ray that has been sent through teeth and supporting tissues has created an image on film known as a dental radiograph. The utility and significance of dental radiographs must be fully understood by the dental radiographer. The dental radiographer also needs to be knowledgeable about dental radiographs' information as well as the uses and advantages of dental radiography.¹ The diagnostic process requires accurate interpretation of radiographic data. A

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dental expert can be crucial in the identification of numerous diseases, lesions, and conditions of the jaws that cannot be diagnosed clinically by being able to recognize what is disclosed by a radiograph. To be able to identify an abnormal look, one must have a thorough understanding of the variations in normal appearance. To accurately and professionally interpret a radiograph, a dental practitioner must be proficient in detecting and identifying the normal anatomical structures and their variations seen in the radiographs taken of the various locations.³⁻⁴

An object or appearance that is considered an artifact was created artificially and is not often visible on the radiograph. Inadequate handling of the film, chemical contamination, and other factors are among the causes of flaws and artifacts, according to the literature.^{1,2} Because they can resemble diseases or can cover up the region of interest, it is crucial to correctly identify these.⁵ This article focuses on a radiolucent object seen on a routine dental radiograph that looks like an area of fracture on the mandible's right side. We also cover the different sources of artifacts and place emphasis on correctly recognizing them so they aren't mistaken for pathology.

2. Case Report

A 28-year-old woman came to the clinic for a routine dental checkup. He had complaints of crowded teeth in the upper and lower jaw. The orthodontist was advised to undergo braces treatment, but previously the patient was asked to take cephalometric and panoramic photographs as a routine procedure before undergoing braces treatment.



Figure 1 The cephalometric imaging revealed a radiolucent image on the patient's right side, extending from the coronoid process to the mandibular ramus



Figure 2 The results of the panoramic imaging also revealed a radiolucent image that appeared to be a fracture line on the patient's right mandible, however it wasn't very distinct

The results of the anamnesis showed that the patient had fallen 3 months ago, directly hitting his face, but there were no serious injuries. The results of the clinical examination did not reveal any abnormal mandibular movements, no pain, no chewing disorders, no asymmetrical facial features and no lower lip paresthesia.

The patient was instructed to take an Eisler photo of the right side of the mandible to determine if there was a fracture there.



Figure 3 A fracture on the right side was not seen in the Eisler imaging results.

3. Discussion

False diagnosis of dental problems or the possibility for unneeded treatment might result from incorrect interpretation of diagnostic data. Important diagnostic information from radiographic imaging helps the clinician create a precise treatment plan for each patient. The practitioner can now more easily acquire radiographic data thanks to digital radiography imaging. Additionally, a variety of software programs offered by digital imaging systems have an impact on the capacity to correctly interpret a radiographic image. Digital images are not interpreted the same way as traditional film is. Firstly, due to the size of computer monitors, Compared to traditional film photographs, digital images are often scaled much larger. Algorithms are used by the digital radiography systems and software solutions now on the market to enable user manipulation of the recorded radiographic data. These include electronic rulers and millimeter grids for superimposing on acquired images, pseudocolor and negative display, measurement of density, histogram analysis of density values, filtering of spatial images, and enlarging a region of interest. A characteristic that helps with one condition's diagnosis might not necessarily help with another condition's diagnosis. More specifically, boosting contrast in digital pictures is frequently used to increase image sharpness and help with the diagnosis of dental pathology, such as proximal caries, ill-fitting restorations, or fractures. Contrast is the difference between the light and dark gray tones in a digital image. Raising the contrast causes the pixel values of a digital image to stretch, making the bright shades lighter and the dark hues deeper.^{2,6}

The general quality of radiographs is diminished by artifacts, which are persistent, undesired, and superfluous marks. They could lead to errors in radiographic diagnosis by simulating or obscuring abnormalities. The diagnostic utility of the generated images may be hindered, limited, or impaired by faults in the panoramic and cephalometry radiography technique. As a way to improve the training of the professional team, it is crucial to assess the frequency of errors of such a widely used procedure in dentistry, as well as the requirement for retaking.⁷⁻¹⁰

In this case, the radiolucent image is an airway space, but because the image resembles a fracture and the patient's history shows that the patient had fallen 3 months ago, directly hitting his face, a differential diagnosis fracture needs to be considered. According to Manu Dhillon's research, the patient in this situation most likely placed his tongue wrongly when capturing cephalometric and panoramic. The most frequent mistake was not placing the tongue against the palate when being exposed. In this case, the patient makes repeated swallowing movements. This is also supported by other research.^{7,20} The failure of the dental technicians to properly instruct the patients to swallow and maintain their tongues on the roof of their mouths may be the cause of this error. Another argument was that sometimes patients can misunderstand instructions and merely place the tip of their tongue on their palates, or that patients might not have paid close attention to the technician's instructions.⁸

There may be a radiolucent strip at the tip of the anterior upper teeth in the image produced by patients whose tongues are not pressed against the palate. It can be slight or more pronounced and prevent this area from being evaluated. However, there are specific situations where adjusting the brightness and contrast when using digital devices may be

helpful. Retakes are necessary, nevertheless, if a good representation of the location is not achievable despite the use of these image enhancement technologies. It is notable that researchers from many studies claim that this kind of inaccuracy occurs frequently, because it depends on how the patients interpret and implement the instruction. Therefore, reinforcements can be used through educational leaflets, professional self-demonstration of placement, or even the employment of tactics like asking the patient to retain a cotton against the palate with their tongue and avoid make swallowing movements when X-rays are taken. In order to recycle professional knowledge and confirm the need for educational procedures with a view to enhancing image quality, it is crucial to periodically monitor the prevalence of errors.^{8,11-13}

4. Conclusion

Dental radiography is a useful tool for both diagnostic and treatment planning. Any radiographic flaws or artifacts render the radiograph falsely diagnostic. The radiolucent artifacts seen in the cephalometric and panoramic radiographic images in this case showed a discrepancy between the results on the right mandibular actual condition, this may be due to the fact that when taking x-rays, the patient makes repeated swallowing movements.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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