

Limitations of Panoramic Radiographs: Report of Two Cases

Panoramik Radyografilerin Kısıtlılıkları: İki Olgu Sunumu

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ABSTRACT

Panoramic radiographs are valuable and technically easy procedures in determining lesions and the other pathological conditions of the jaw. However, it should be recognized that there are obvious limitations in these films. These limitations include distortions, magnifications, and difficulties in identifying the relationship of the lesions with vital structures.

This study presented two cases that indicated the limitations of panoramic radiographs. In the first case, a radiolucent lesion was detected on panoramic radiography. The borders of the lesion were associated with the mandibular canal and mental foramen. In the second case, two radiolucent areas were seen on panoramic radiography. They were determined to be in relation to the maxillary sinus and mental foramen. Following the screening panoramic examination, cone beam computed tomography (CBCT) was obtained in both of the cases. The CBCT views demonstrated no relationship between the lesions and the anatomical structures detected in the panoramic radiographs.

In conclusion, using only panoramic radiographs is not enough for the detection of the anatomic relationships and borders of the lesions. We suggest that dentists need 3D images to provide the correct information for presurgical assessments.

Key Words: Panoramic radiography, dental tomography, pathology

ÖZET

Panoramik radyografiler, çenelerdeki lezyonların ve diğer patolojik durumların tespitinde, teknik olarak kolay ve değerli bir yöntemdir. Ancak, bu filmlerin bazı kısıtlılıklarının olduğu bilinmektedir. Bu kısıtlılıkların en önemlileri; distorsiyonlar, magnifikasyonlar ve lezyonların vital yapılarla olan ilişkilerinin belirlenmesindeki zorluklardır.

Bu çalışmada, panoramik radyografilerin kısıtlılıklarını gösteren iki olgu sunulmuştur. Birinci olguda, panoramik radyografide radyolüsent bir lezyon saptandı. Lezyonun sınırlarının, mandibular kanal ve mental foramen ile ilişkili olduğu görüldü. İkinci olguda, panoramik radyografide iki adet radyolüsent alan izlendi. Bu alanların, maksiller sinus ve mental foramen ile ilişkide olduğu görüldü. Panoramik görüntülemenin ardından, her iki olgunun da Konik Işınlı Bilgisayarlı Tomografi (KİBT) görüntüleri alındı. KİBT görüntülerinde, lezyonların, panoramik radyografide görülen anatomik yapılar ile ilişkisinin bulunmadığı saptanmıştır.

Sonuç olarak, lezyonların sınırlarının ve anatomik ilişkilerinin belirlenmesinde, panoramik radyografiler tek başına yeterli değildir. Diş hekimlerinin, cerrahi öncesinde doğru teşhis için, üç boyutlu görüntüleme yöntemlerini kullanmalarının gerekli olduğunu düşünmekteyiz.

Anahtar Sözcükler: Panoramik radyografi, dental tomografi, patoloji

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Introduction

In the practice of oral surgery, detecting the accurate position and course of anatomical landmarks (mandibular canal, mental foramen, maxillary sinus, etc.) is extremely important in preventing complications (1). Panoramic radiographs allow the examination of patients by supplying helpful and even essential information in this regard. It is useful for evaluating the maxillofacial and/or dentoalveolar complex and pathologies of the jaw (2). In addition, the localization of the anatomical structures, eruption and growth patterns of the teeth, and fractures of the jaws should be preoperatively evaluated by these films (3).

In general, most dentists prefer to use panoramic imaging because of its advantages, such as speed, low patient dose, broad anatomic coverage, and high patient acceptability (4). However, several limitations of these radiographs were noted in the literature (1-6). For instance, the image quality of these films is not as sharp as intraoral radiographs. Therefore, the details of cystic and tumoral pathologies may not be clearly identified. Moreover, the amount of magnification and overlapping of the structures may result in a misdiagnosis (5, 6).

In this paper, two cases were reported that were evaluated with both panoramic radiographs and cone beam computed tomography (CBCT); (Planmeca ProMax® 3D; Rosella, USA) before surgery. We aimed to emphasize the limitations of panoramic radiographs in an oral surgery practice.

Case 1

A 52-year-old male patient applied to Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Bezmialem Vakif University for a routine dental examination. He had a history of renal transplantation and immunosuppressive drug intake. His intraoral examination revealed that there were tipping of the teeth and restorations in different regions. On the panoramic radiography, a radiolucent lesion with well-defined borders was detected between his right lower canine and premolar teeth. According to the panoramic radiography, it was associated with the mandibular canal and mental foramen (Figure 1). The patient's CBCT scans clearly demonstrated the position of the mental foramen and mandibular canal, and there was no relationship with the cyst cavity (Figure 2 a-e). After written informed consent was obtained from the patient, the lesion was treated with enucleation and curettage under local anesthesia. Postoperatively, there was no evidence of paresthesia or a recurrent or residual lesion.

Case 2

A 46-year-old female patient was referred to Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Bezmialem Vakif University with a complaint of several missing teeth. Systemically, she was healthy. On examination, decayed teeth and failed full-mouth fixed restorations were observed. On panoramic radiography, two radiolucent areas were detected



Figure 1. Case #1. The panoramic radiograph shows the lesion. It seems to be associated with the mandibular canal and mental foramen (white arrow)

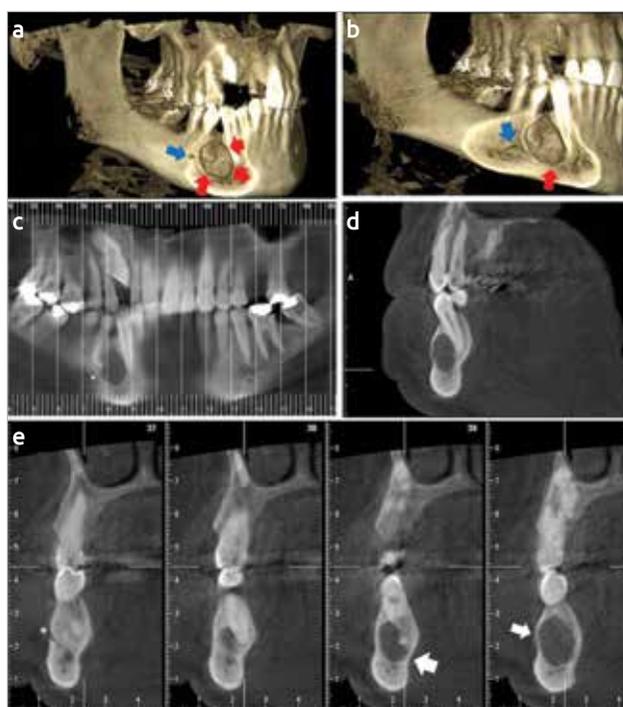


Figure 2. a-e. Case #1. (A and B) 3-D views show the localization of the lesion and anatomic landmarks: Mental foramen (blue arrow), borders on the cortical bone (red arrows), (C) panoramic reconstruction, (D) and sagittal view of the lesion; (E) lingual and buccal borders of the lesion are clearly seen in the cross-section views (white arrows). section 37 shows the mental foramen (white astral)

on both the maxilla and mandible, and they were noted in relation to the maxillary sinus/nasal cavity and mental foramen (Figure 3). However, the CBCT scans showed that both the maxillary sinus and mental foramen were separated from the cavity of the cystic lesions (Figure 4). The written informed consent was obtained from the patient. The lesions were treated by enucleation with curettage under local anesthesia. This anatomic separation was seen during the surgery (Figure 5). The postoperative period was uneventful.

Discussion

It is clear that the hard and soft tissues of the oral cavity are related to vital structures, such as the inferior alveolar nerve

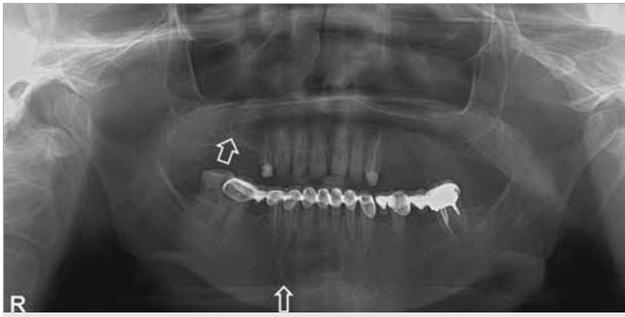


Figure 3. Case #2. The panoramic radiograph shows the lesions. They seem to be associated with the mandibular canal and mental foramen in the lower jaw and the maxillary sinus and nasal cavity in the upper jaw (white arrows)

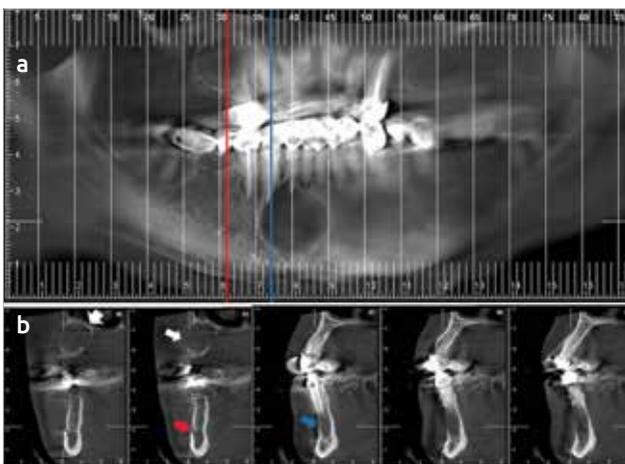


Figure 4. Case #2. (A) Panoramic reconstruction, (B) cross-section views of the lesion; section 31 shows the localization of mental foremen (red line and arrow), and section 37 shows the distal border of the radicular cyst (blue line and arrow). In the upper jaw, borders of the radicular cyst and intact maxillary sinus floor and nasal cavity appear on the cross-section views (white arrows)

(IAN), the lingual nerve, the mental nerve, the mental foramen, the nasal cavity, and the maxillary sinus. The protection of these structures during surgery is necessary in providing the postoperative morbidity of the patients (1,5). In the cases presented here, the decision was made to perform CBCTs to obtain more precise locations and definitions of the lytic areas. In the CBCT analysis, axial, sagittal, and cross-sectional images and 3D reconstruction views were used to determine the correct localizations of the anatomical landmarks. In this way, the surgical excisions were performed in a reliable surgical site (7).

Damage to the IAN, lingual nerve, and mental nerve is a serious complication, contributing to the altered sensation of the oral soft tissues, such as the lower lip, chin, buccal gingiva, and tongue. In many cases, panoramic radiographs provide valuable information for the proper diagnosis and surgical management. Blaeser et al. (8) reported that there is an increased risk for nerve injury with positive panoramic radiographic findings, such as the diversion of the inferior alveolar canal, the darkening of the third molar root, and the interruption of the cortical white line. On the other hand, Neves et al. (9) reported an effective adjunct in determining the risk relationship between the tooth roots and mandibular canal, requiring 3D evaluation of the jaws. In addition, Ezirganli et al. (10) reported that using only panoramic radiographs is not always enough to get the correct diagnosis of jaw pathologies. The presented cases showed the limitations of panoramic radiographs before surgery.

High-resolution cross-sectional images of teeth and the maxillofacial region are provided with CBCT scans. Intrabony defects, root fractures, and implant areas should be analyzed. It enables the clinician to measure the lengths in the alveolar bone for the presurgical assessment. It can produce different diagnoses and treatment plans in oral surgery (11).

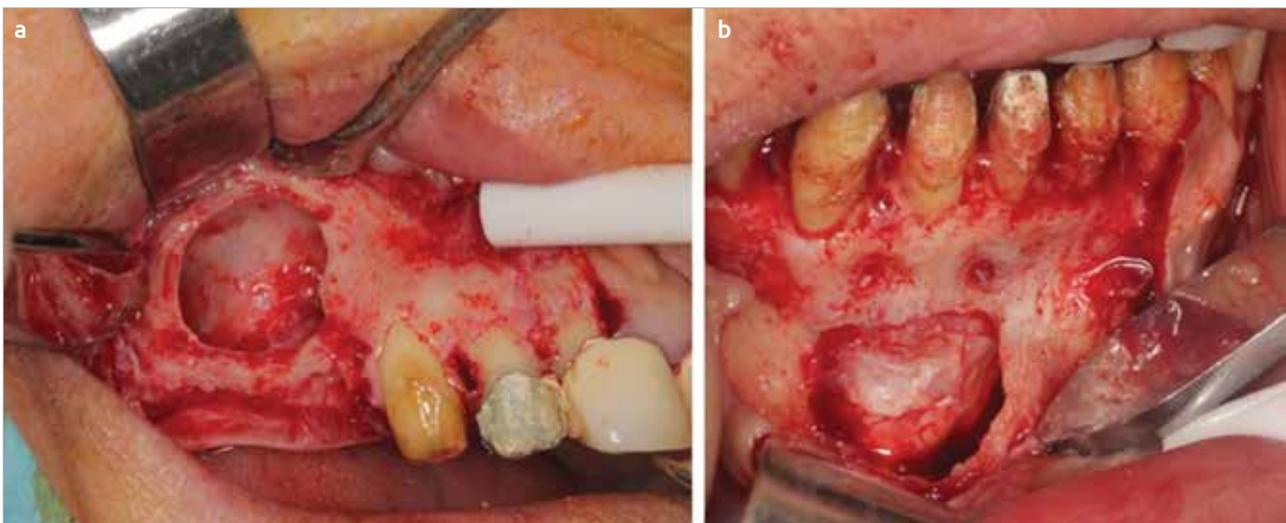


Figure 5. a, b. Case #2. (A) Photograph of the cyst cavity and surgical site after enucleation of the lesion. (B) Photograph of the cyst membrane and surgical site; it seems that there is no relationship between the cavities and vital anatomical structures

The principal disadvantages of conventional tomography include higher cost and radiation dose. However, a CBCT provides a lower dose than conventional tomography. Ludlow et al. (12) reported that the dose is related, depending on the field of view (FOV) and selected technical factors. The comparable panoramic examination doses (6.3 mSv, 13.3 mSv) are 4 to 42 times greater than the CBCT dose.

Conclusion

In conclusion, the identification of the correct localization of lesions is critically important in maintaining a good preoperative surgical plan and in reducing the risk of nerve injury. Hence, dentists should obtain a dental tomograph if they suspect anatomical relationships with jaw pathologies.

Informed Consent: Written informed consent was obtained from the patients who participated in this case.

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