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Extensive Concha Bullosa Detected Incidentally During Cone-Beam Computed Tomography Examination: A Case Report

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Abstract

Concha bullosa is a common anatomical variation characterized by the pneumatization of the nasal turbinates and is most often detected incidentally. This case report aims to present an incidentally detected extensive concha bullosa identified during cone beam computed tomography examination and to emphasize its clinical significance in dentistry. A 36-year-old female patient presented to the clinic with pain in the right anterior maxillary region. Clinical and radiographic examinations included periapical radiography, panoramic radiography, and cone beam computed tomography. Cone beam computed tomography revealed periodontal bone loss and apical root resorption of tooth number 12, apical hypodense lesions associated with several teeth, bilateral maxillary sinus mucosal thickening, and extensive concha bullosa involving the middle turbinate. The patient was referred to the appropriate dental specialties for the management of the dental findings and to the otorhinolaryngology department because of the presence of concha bullosa. In conclusion, systematic evaluation of all anatomical structures included within the field of view of cone beam computed tomography may facilitate the early recognition of incidentally detected but clinically significant anatomical variations and contribute to appropriate multidisciplinary patient management.

Keywords: Cone-beam computed tomography, Concha bullosa, Dental radiology, Incidental finding, Middle turbinate.

1. Introduction

Numerous anatomical variations can be observed throughout the human body. While some of these variations may give rise to various clinical manifestations, others remain asymptomatic throughout life. Certain anatomical variations may increase the risk of complications during surgical procedures. These variations are often detected incidentally during radiographic examinations performed for various clinical indications. With the increasing use of different imaging modalities in dentistry, incidental detection of these anatomical variations has become more frequent [1-3]. Panoramic radiography and cone beam computed tomography are currently among the most commonly used imaging modalities in clinical dental practice. Panoramic radiography provides a comprehensive overview of the jaws and adjacent anatomical structures in a single image. Owing to its relatively low radiation dose and cost-effectiveness, it is widely used to obtain general diagnostic information about the teeth and surrounding structures. However, panoramic radiography is limited by image distortion, magnification, and superimposition. Therefore,

when detailed evaluation of anatomical structures is required, cone beam computed tomography is the preferred imaging modality because it provides three-dimensional visualization with high spatial resolution [4-6].

The nasal cavity contains the inferior, middle, and superior turbinates, which are symmetrically located on both sides. Owing to the complex anatomy of the nasal cavity, mucociliary drainage and sinus ventilation may be impaired under certain conditions. Concha bullosa, a common anatomical variation resulting from the pneumatization of the nasal turbinate, has been reported to interfere with mucociliary drainage and sinus ventilation [7, 8]. This case report aims to highlight the presence and clinical significance of this anatomical variation, which is most often detected incidentally by radiologists during radiographic examinations.

2. Case History

A 36-year-old Turkish female patient presented to the clinic with pain in the right anterior maxillary region. A detailed medical history revealed no systemic diseases, drug allergies, or previous surgical procedures. Clinical examination showed that the patient was undergoing fixed orthodontic treatment with brackets, which had been initiated four months earlier. Tenderness was detected in the region of tooth number 12.

Clinical findings: No facial asymmetry was observed. Temporomandibular joint examination revealed no abnormalities. Intraoral examination demonstrated marked gingival inflammation around tooth number 12 and mild gingival inflammation in the remaining dentition. Palpation of tooth number 12 elicited pain, and a periodontal pocket was detected around the affected tooth. Teeth number 36 and 46 were missing. Teeth number 37 and 47 were mesially tilted toward the extraction spaces, and periodontal pockets were observed on their mesial aspects. Restorative filling materials were present in teeth number 14, 16, 25, 37, 38, and 47. Marginal discrepancies between the restorative filling material and the dental hard tissues were identified in teeth number 16 and 37. Based on the clinical findings and the patient's preference, radiographic examinations were performed.

Radiographic examination: Initially, periapical and panoramic radiographs were obtained. Cone beam computed tomography was subsequently performed to allow a more detailed evaluation of tooth number 12. All clinical examinations and radiographic evaluations were performed by the author of this study.

Periapical radiographic findings: Periodontal bone loss was observed around tooth number 12, together with subtle apical root resorption associated with the same tooth.

Panoramic radiographic findings: Root canal treatment was identified in teeth number 16, 25, and 38. Secondary caries was detected in tooth number 37. Periapical radiolucent lesions were observed in association with teeth number 16 and 25.

Cone beam computed tomography findings: Cone beam computed tomography images were acquired using a slice thickness of 0.3 millimeters with exposure parameters of 110 kilovolts peak and 7.06 milliampere-seconds. The images were evaluated using NNT Viewer version 16.9 software on a 15.6-inch monitor with a maximum resolution of 1920 × 1080 pixels. Periodontal bone loss and millimeter-sized apical root resorption were identified in tooth number 12. A hypodense lesion measuring approximately 4.2 × 4.5 × 4.6 millimeters was detected at the apex of tooth number 25. In addition, millimeter-sized hypodense lesions were observed at the apices of teeth number 16 and 37. Considering the presence of trabecular bone within these hypodense lesions, they were considered compatible with apical scars, and radiographic follow-up was recommended. Bilateral maxillary sinus mucosal thickening was also

observed. Evaluation of the nasal cavity revealed extensive concha bullosa involving the middle turbinate (Figure 1). Following the oral and maxillofacial radiology assessment, the patient was referred to the departments of restorative dentistry, orthodontics, periodontology, and otorhinolaryngology for further management.

Figure 1. Coronal cone-beam computed tomography image demonstrating extensive concha bullosa of the middle turbinate.

3. Discussion

Human anatomy exhibits considerable variation among individuals. Variations in anatomical structures within normal limits are considered natural and are referred to as anatomical variations. While some anatomical variations remain asymptomatic, others may give rise to various clinical manifestations. Knowledge of these variations is essential for establishing an accurate diagnosis during clinical evaluation and for minimizing the risk of complications during surgical procedures. The prevalence of anatomical variations may be influenced by several factors, including ethnicity, sex, and dietary habits. In the past, anatomical variations were primarily identified through cadaveric studies and surgical procedures; however, advances in imaging modalities have enabled their routine detection in clinical practice [9-16].

A variety of imaging modalities are used in dentistry. Among the two-dimensional imaging techniques, periapical radiography is primarily used to evaluate the tooth of interest and its adjacent structures. Panoramic radiography provides a comprehensive assessment of both jaws and the surrounding anatomical structures in a single image, allowing simultaneous evaluation of multiple regions. Despite their relatively low radiation exposure, these imaging modalities are limited by disadvantages such as

distortion, magnification, and superimposition. Therefore, three-dimensional imaging techniques are preferred when a more detailed evaluation of anatomical structures is required. Among these modalities, cone beam computed tomography is the most widely used for hard tissue assessment in dentistry because of its relatively low radiation dose, cost-effectiveness, and high spatial resolution. In addition to dentoalveolar structures, cone beam computed tomography enables detailed evaluation of numerous anatomical structures, including concha bullosa [4, 17, 18].

Concha bullosa refers to the pneumatization of the nasal turbinates. Although it most commonly involves the middle turbinate, it may also occur in the inferior and superior turbinates. This anatomical variation may be unilateral or bilateral and is classified into three types: lamellar, bulbous, and extensive. The reported prevalence of concha bullosa ranges from 5% to 70% in the literature. This wide variation in prevalence may be attributed to differences in genetic background, study populations, and imaging methodologies. Extensive concha bullosa, which involves pneumatization of a large portion of the middle turbinate, may impair sinus drainage by narrowing the middle meatus and the osteomeatal complex. Consequently, mucosal thickening and chronic sinusitis may develop. In addition, a positive association has been reported between concha bullosa and nasal septal deviation, and the importance of recognizing this anatomical variation for planning surgical procedures in the sinonasal region has been emphasized in the literature [8, 19-22]. In symptomatic cases, patients should be informed about the potential clinical implications of concha bullosa and referred to an otorhinolaryngologist when appropriate. Therefore, recognition of this anatomical variation by dental practitioners is of considerable clinical importance.

4. Conclusion

In conclusion, concha bullosa is an anatomical variation that may be detected incidentally during cone beam computed tomography examinations performed in dental practice. Extensive concha bullosa is of particular clinical importance because of its potential to affect the osteomeatal complex and impair sinus drainage. Therefore, dental practitioners should systematically evaluate all anatomical structures included within the field of view rather than limiting their assessment to the dentoalveolar region.

5. References

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