STUDY OF THE NASAL SEPTUM AND ITS VARIATIONS THROUGH DYNAMIC NAVIGATION USING A NEW CONE-BEAM COMPUTED TOMOGRAPHY SOFTWARE IN A BRAZILIAN SUBPOPULATION

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ABSTRACT

Objective: To determine the frequency of nasal septum deviation (NSD) and the anatomical variations of the nasal septum through dynamic navigation using a new cone-beam computed tomography software in a Brazilian subpopulation. **Methodology**: The study sample consisted of 200 cone-beam computed tomography scans of patients of both sexes. Inclusion criteria involved scans that presented the nasal septum within the field of view. The following were considered to determine nasal septum deviation in cone-beam computed tomography images: gender, age, and nasal septum deviation (presence or absence). The method for determining anatomical variations of the nasal septum in cone-beam computed tomography images included Mladina's classification. Statistical analysis was performed using the Statistical Package for the Social Sciences software, version 20 (SPSS, Chicago, IL), with variables described as frequencies and percentages and evaluated by the chi-square test. **Results:** There was a predominance of female individuals and those aged between 31 and 50 years. 51.00% of the sample had a normal nasal septum. Among the population with septal deviation, 15.50% had Type III deviation, 13.50% had Type I deviation, 8.50% had Type II deviation, 4.50% had Type IV deviation, 4.0% had Type V deviation, 3.50% had Type VI deviation, and 0.50% had Type VII deviation.

Keywords: Anatomy; nasal septum; maxillary sinus; cone-beam computed tomography.

INTRODUCTION

Pathologies of the paranasal sinuses are considered significant health problems across different continents (TAGHILOO & HALIMI, 2019). One of the causes of rhinosinusitis is the blockage of the sinus ostium. This anatomical structure is located in the nasolateral area called the osteomeatal complex, which, under normal conditions, ensures proper drainage and ventilation of the paranasal sinuses. Among the paranasal sinuses, the maxillary sinus consists of a cavity located in the body and zygomatic process of the maxilla, with characteristics comparable to a quadrangular pyramid, having the lateral wall of the nasal cavity as its base and the zygomatic bone as its apex (BROOK, 2006).

The human nasal cavity includes a midline septum that separates the right and left cavities. Nasal septum deviation (NSD) consists of the misalignment of bone or cartilage (or both) of the nasal septum from the midline, which can lead to respiratory diseases due to a reduction in nasal cavity volume. Its prevalence varies from 0.93% to 55% among different populations, with a higher prevalence in adults, reaching up to 90% (YILDIRIM & OKUR, 2003; MLADINA et al., 2008). Nasal septum deviation can cause headaches due to inflammation of the paranasal sinuses, breathing difficulties, nasal obstruction that impairs nasal respiration and reduces airflow and even affects craniofacial development and facial skeletal morphology, leading to mouth breathing, skeletal open bite, maxillary transverse deficiency with crossbite, increased resistance of nasal airways, or even anosmia (loss of smell) (YILDIRIM & OKUR, 2003).

The diagnosis of nasal septum deviation is based on clinical examination associated with tests such as rhinoscopy, endoscopy, multislice computed tomography (CT), and magnetic resonance imaging. Some authors have presented multislice computed tomography as the gold standard for accurate analysis of the paranasal sinuses and nasal cavities. Other studies indicate that this imaging exam has a higher cost and exposes the patient to a considerably greater radiation dose compared to cone-beam computed tomography (CBCT) (LUDLOW et al., 2015).

The clinical incorporation of computed tomography (CT) and cone-beam computed tomography (CBCT) has represented an extraordinary advancement in the health fields

(medicine and dentistry), enabling greater accuracy in diagnosing infectious processes. Several studies have highlighted the importance of tomographic examination for analyzing the morphological characteristics of the maxillary sinus and its relationship with upper tooth roots (ESTRELA et al., 2016, 2018; BUENO et al., 2018, 2021). A sophisticated CBCT software (e-Vol DX®) was recently developed with significant potential to improve image quality. This software enables high-resolution images due to submillimeter voxel sizes, dynamic image navigation in multiple planes, the ability to adjust volume parameters such as slice thickness, slice intervals, data correction through image filters, and manipulation of brightness and contrast (BUENO et al., 2018, 2021; ESTRELA et al., 2018).

Given the importance of knowledge about human anatomy and its anatomical correlations, the value of multidisciplinary approaches in healthcare (such as medicine and dentistry), and the information obtained through sophisticated 3D imaging exams, this study aims to determine the frequency of nasal septum deviation and its anatomical variations using dynamic navigation with a new cone-beam computed tomography software in a Brazilian subpopulation, highlighting the clinical significance of the present study.

METHODOLOGY

This cross-sectional study included 200 cone-beam computed tomography scans of patients referred for diagnostic purposes between January 2015 and December 2020. Since this was a retrospective study analyzing CBCT scans recorded in a secondary database, informed consent (ICF) was waived. This research is part of a larger study approved by the Research Ethics Committee of the Federal University of Goiás (CAAE: 06486919.0.0000.5083).

The inclusion criteria for the imaging exams involved those that presented the nasal septum within the field of view. The exclusion criteria included exams that presented bone alterations associated with systemic diseases, benign and/or malignant neoplasms in the maxilla and maxillary sinus, cleft palate, and previous history of nasal surgery.

The anatomical variations of the nasal septum were verified in the cone beam computed tomography images, visualized with the aid of the CBCT software (e-Vol DX),

analyzed, and tabulated in an Excel spreadsheet. The criteria for determining the anatomical variations of the nasal septum, in cone beam computed tomography images were related to gender, age, nasal septum deviation (presence or absence), and its type according to the Mladina classification (Mladina et al., 2008).

All the criteria described were tabulated in an Excel spreadsheet. The analysis of cone beam computed tomography images was performed using a specific filter in the e-Vol DX software (Bueno et al., 2018). All analyses were performed jointly by two examiners, specialists in radiology and imaging, with experience in cone beam computed tomography (CBCT) examinations for more than ten years. The examiners were previously calibrated by analyzing examinations that followed the inclusion and exclusion criteria of the study, with the total corresponding to 10% of the sample. In the absence of consensus, a third examiner, with the same qualifications, was called for the final decision.

RESULTS

There was a prevalence of female individuals (60.5%) and 54.50% of individuals aged between 31 and 50 years. It was found that 51.00% of the samples had a normal nasal septum, that is, this population did not have a deviated septum, but 49.00% demonstrated a deviated nasal septum.
It was found that 51.00% of the sample had a normal nasal septum. Among the population that presented septal deviation, that is, 98 individuals, it was observed that 15.50% presented Type III deviation (deviation located within the nasal cavity, at the level of the middle turbinate), while 13.50% presented Type I deviation (deviation of the anterior or cartilaginous part of the nasal septum in the region of the nasal valve, but which does not touch the valve), 8.50% presented Type II deviation (deviations of the anterior or cartilaginous part of the nasal septum in the region of the nasal valve, but which touches the nasal valve), 4.50% presented Type IV deviation (doubly curved nasal septum, in the shape of an S, in which the anterior curve is usually located in the region of the nasal valve, while the posterior curve is located further inside the nasal cavity), 4.0% Type V deviation (deviation located in the bony septum and contains an almost horizontal bone spur), 3.50%

Type VI deviation (unilateral bone spur parallel to the horizontal plate that has a bulge on one side and a "trough" on the other) and 0.50% type VII deviation (combination of two or more types of the above-mentioned deviations).

CONCLUSION

There was a prevalence of female individuals aged between 31 and 50 years. 51.00% of the sample presented nasal septum without deviation. Among the population that presented deviation, it was observed that 13.50% presented Type I deviation, 8.50% presented Type II deviation, 15.50% presented Type III deviation, 4.50% presented Type IV deviation, 4.0% Type V deviation, 3.50% Type VI deviation and 0.50% Type VII deviation (combination of two or more types of the deviations mentioned above).

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