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Original Research Article.

To Assess the Anatomical Variations of Paranasal Sinuses on Computed Tomography: A Retrospective Analysis

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ABSTRACT

Background: Paranasal sinuses are a group of four paired air filled, mucosa lined spaces surrounding the nasal cavity. The pneumatization or hypoplasia of the sinuses affects the drainage pathways, causing chronic infections and complications. The aim of the present study was to assess the anatomical variations of paranasal sinuses on computed tomography.

Materials and Methods: The present retrospective study was carried out over the period of 6 months using 80 CBCT images of patients, with their age group ranging from 20-50 years referred for different oral diagnostic purposes. An assessment of paranasal sinuses and it's variations were accurately characterized in axial, coronal and sagittal sections. The data was analysed statistically using SPSS 21 software and Chi square test was used to find the statistical significance.

Results: In the present study total participant were 80 in which 56.25% were having anatomical variation. 8.75% were having variation in agar nasi cells,10% were having variation in Kuhn cells, 7.5% were having variation in Onodi cells, 5% were having variation in haller cells, 10% were having variation in concha bullosa, 12.5% were having variation in nasal septum deviation, 20% were having variation in maxillary sinus septa, 17.5% were having variation in sphenoid sinus pnematization, 2.5% were having variation in maxillary sinus pnematization, 6.25% were having variation in Crista galli pneumatisation.

Conclusion: This study concluded that imaging of the PNS will aid in diagnosis in individual patients, and also provide a deeper understanding of the manifestations of the disease.

Keywords: Pnematization, Concha Bullosa, Onodi Cells, Paranasal Sinus.

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INTRODUCTION

The paranasal sinuses (PNSs) are air-filled, mucosa-lined cavities that develop in the facial and cranial bones and communicate with the nasal airways. The paranasal sinuses are group of air filled spaces surrounding the nasal cavity; which start developing from the primitive choana at 25–28 weeks of gestation.[1] Three projections arise from the lateral wall of the nose and serve as the beginning of the development of the paranasal sinuses. The anterior projection forms the Agger nasi, the inferior or maxiloturbinate projection forms the inferior turbinates and maxillary sinus, while the superior or ethmoidoturbinate projection forms the ethmoidal air cells and their corresponding drainage channels. The sinuses are named from the facial bones in which they are located. The maxillary and ethmoid sinuses are aerated at birth, while the sphenoid sinuses and frontal sinuses are pneumatized at about the 2nd and 6th year of life respectively.[1] The sinuses reach the adult size at adolescent age.[2] However, their function is not known, and has been the subject of much speculation. Some argue that they could be involved in decreasing the weight of the skull and others postulate that they may act as resonators for voice.[1] Anatomic variations of this region must be understood in detail, otherwise serious complications, such as cerebrospinal fluid leakage, meningitis or blindness may occur during surgery.[3] Therefore, the present retrospective study was conducted to asses anatomical variations of paranasal sinuses on computed tomography.

MATERIALS AND METHODS

The present retrospective study was carried out over the period of 6 months using 80 CBCT images of patients, with their age group ranging from 20-50 years referred for different oral diagnostic purposes. Before the commencement of the study; ethical approval was taken from the Ethical Committee of the institute and informed consent was obtained from the patient. Patients below

age 20 years of age were excluded from the study because of incomplete sinus development. The indications for CBCT examinations were implant planning or oral surgery procedure planning (removal of impacted third molars), orthodontic planning. Trauma cases and patients with cleft lip and palate and facial deformity are excluded from the study. Evaluation of presence of anatomical variations of paranasal sinuses in CBCT images was carried out. An assessment of paranasal sinuses and it's variations were accurately characterized in axial, coronal and sagittal sections. The data was analysed statistically using SPSS 21 software and Chi square test was used to find the statistical significance.

RESULTS

In the present study total participant were 80 in which 56.25% were having anatomical variation. 8.75% were having variation in agar nasi cells,10% were having variation in Kuhn cells, 7.5% were having variation in Onodi cells, 5% were having variation in haller cells, 10% were having variation in concha bullosa, 12.5% were having variation in nasal septum deviation, 20% were having variation in maxillary sinus septa, 17.5% were having variation in sphenoid sinus pnematization, 2.5% were having variation in maxillary sinus pnematization, 6.25% were having variation in Crista galli pneumatisation.

Table 1: Incidence of anatomical variation

Anatomical variation	Total case 80 (%)
Present	45(56.25%)
Absent	35(43.75%)

Table 2: Incidence of individual paranasal sinus variation

Anatomical variation	Total case 80 (%)
Agar nasi cells	7(8.75%)
Kuhn cells	8(10%)
Onodi cells	6(7.5%)
Haller cells	4(5%)
Concha bullosa	8(10%)
Nasal septum deviation	10(12.5%)
Maxillary sinus septa	16(20%)
Sphenoid sinus pneumatization	14(17.5%)
Maxillary sinus pneumatisation	2(2.5%)
Crista galli pneumatization	5(6.25%)

DISCUSSION

Nasal cavity and paranasal sinuses together configurate a single anatomical and functional unit.[4] This region is subject to a large number of anatomical variations and a variety of lesions. The potential role of anatomical variations of the paranasal sinus region is mainly predisposed to recurrent sinusitis and, in selected cases, headache.[5]

In the present study total participant were 80 in which 56.25% were having anatomical variation. 8.75% were having variation in agar nasi cells,10% were having variation in Kuhn cells, 7.5% were having variation in Onodi cells, 5% were having variation in haller cells, 10% were having variation in concha bullosa, 12.5% were having variation in nasal septum deviation, 20% were having variation in maxillary sinus septa, 17.5% were having variation in sphenoid sinus pnematization, 2.5% were having variation in maxillary sinus pnematization, 6.25% were having variation in Crista galli pneumatisation.

Kuhn cells (frontal cells/ frontoethmoidal cells) are group of anterior ethmoidal cells. There are four types mainly, type I- Single cell above the agar nasi cell, type II- two or more cells above the agar nasi cell, type III- single cell extending from the agar nasi cell into the frontal sinus, type IV- isolated cell within the frontal sinus (loner cell). In this, type III and type IV have higher chances of frontal sinusitis.[6] The presence of septa at or near the floor of the sinus are of interest to the dental clinician when performing sinus floor elevation procedures because of an increased likelihood of surgical complications, such as tearing of the Schneiderian membrane.[7]

Extensive maxillary sinus pneumatization (EMSP) was defined when the largest horizontal and/or vertical dimension of the maxillary sinus was equal to or exceeded 90% of the corresponding diameter of the orbit. In a study by Meyer, et al., the prevalence of EMSP was found to be 8% (7% bilateral and 1% unilateral). [8]

In the study by Talaiepour AR et al. Agger nasi was seen in 56.7% of cases, with 17.5% on the right, 7.7% left and 31.5% bilateral.[9]

T. D. Thimmappa et al, studied Haller Cells in 13% of patients of which it was left sided in 7%, right sided in 4% & both sided in 2% of cases.[10] Onder Turna et al,[11] Shpilberg KA et al,[12] have observed Onodi cells in 13.5% & 12% of cases respectively.

CONCLUSION

This study concluded that imaging of the PNS will aid in diagnosis in individual patients, and also provide a deeper understanding of the manifestations of the disease. It is of paramount importance that computed tomography of the paranasal sinuses in three dimensions of axial, coronal and sagittal imaging be acquired and adequately reviewed prior to functional endoscopic sinus surgery (FESS).

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