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ANATOMICAL VARIATIONS OF THE PARANASAL SINUSES IN PATIENTS USING COMPUTED TOMOGRAPHY (CT) IN COSTAL REGION OF KARAIKAL

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Abstract

This study was carried out to know the frequency of occurrence of common anatomic variants in computed tomography of paranasal sinuses and nasal cavity. Non contrast Computed tomography (CT) of paranasal sinuses of 50 patients referred to Department Of Radiology, were retrospectively studied. The Multi-detector computed tomography (MDCT) scans were evaluated for various anatomical variants of paranasal sinuses and nasal cavity. The frequency of occurrence was calculated in percentage. We found out that deviated nasal septum (DNS) was the most common variant in this study, seen in 86% of cases, followed by Agger nasi cells which was seen in 56% and the third most common was supra-orbital ethmoidal cells seen in 42% of the study population. All the cases included in the study, had minimum of one variant. Most of the study population showed multiple anatomical variations of paranasal sinus and nasal cavity.

Keywords - Paranasal sinuses, Computed tomography, Nasal turbinate, Ostiomeatal complex, Radiologic anatomy

Introduction

During the first 25–28 weeks of pregnancy, the primitive choana begins to develop into a group of air-filled spaces surrounding the nasal cavity. Paranasal sinuses begin to develop from three projections on the lateral wall of the nose. In its anterior projection, the ethmoidoturbinate is confluent with the ethmoidal air cells, while its inferior or maxiloturbinate is confluent with the inferior turbinates and maxillary sinuses. The sinuses are named after their placement in the facial bones. During the 2nd and 6th year of life, sphenoid and frontal sinuses are pneumatized, whereas maxillary and ethmoid sinuses are aerated at birth. As we grow up, our sinuses become the size of adults [1].

For detecting sinonasal diseases and planning surgical interventions, radiologic evaluation of the paranasal sinuses is essential. In the evaluation of the sinuses, radiography and computed tomography are used along with magnetic resonance imaging. Sinus CT scans often detect numerous sinonasal anatomic variants. Infraorbital ethmoidal cells (Haller) and sphenoethmoidal cells (Onodi) make up the more common ones. Among the few that are unusual are concha bullosa, Agger nasi cells, and infraorbital ethmoidal cells (Haller). Air cells in the anterior regions of an ethmoidal system are known as Agger nasi cells. In relation to the frontal recess, they are posterior, lateral, and inferior. An infundibulum-lateral maxillary sinus ostium is surrounded by ethmoidal cells called infraorbital ethmoidal (Haller) cells. The sphenoethmoidal cells (Onodi cells) encircle and provide essential support to the optic nerve in the sphenoid sinus, superiorly, and posteriorly [2].

Uncinate sinus pneumatization (or uncinate galla) is a less common anatomic variant of the paranasal sinuses, as are large ethmoidal bullae, supraorbital cells, and pneumatized crista galli. In axial CT images, a bony septum between the frontal sinus and anterior ethmoidal artery is indicative of a supraorbital ethmoidal air cell that is located posterolaterally to the

frontal sinus, superiorly and laterally to the lamina papyracea, and anterior to the anterior ethmoidal artery. In order for the crista galli to become pneumatized, the frontal sinuses must be occupied. During this study, the paranasal sinus anatomy is studied using computed tomography among Karaikal residents and variants are described that may lead not only to chronic sinusitis but to other complications as well [3].

Materials and methods

Patients and study details

The Radiology department of our institution retrospectively searched its radiology database for all computed tomography scans of the paranasal sinuses performed over the last year. Symptoms related to the sinonasal region led to a computed tomography (CT) scan for the patients. Five hundred and fifty consecutive CT studies of the paranasal sinuses were analyzed; patients with facial trauma, pathologically positive paranasal sinuses, head and neck tumours, and previous surgery were excluded. In total, 50 participants were included in the 55 CT studies, of whom 35 were male and 20 were female, ranging in age from 18 to 82.

CT examination

GE Hispeed-NX/I Base-2002 Dual Slice Helical CT machine was used for the CT examination. The slice thickness on the coronal section was 5 mm, while the table index was 4 mm. We took a section between the anterior frontal sinus and the posterior sphenoid sinus. There were 125 KVPs, 450 mAs, and a scan time of 5 seconds. The patients were positioned on the scanner couch prone with their heads hyperextended. Infraorbitomeatal line (IOML) angulation was perpendicular to the gantry. Taking slices at intervals of 3 mm, the axial slice thickness was 3 mm. During the procedure, the patient was positioned supine. We took the section from the roof of the frontal sinus to the hard palate with a gantry angle of IOML. In

the coronal scan, we used the same exposure factors. The authors are radiologists who analyzed the images.

Data analysis

A Fisher exact test was conducted to compare the prevalence of anatomic variants between the two groups in the paranasal sinuses and nasal cavity. A Fisher exact test was performed to compare the results for the two groups when appropriate, and the proportion of bilateral anatomic variations was calculated for each group. Statistics were considered significant when p0.05 was used for all comparisons in this study.

Results

The patient population consisted of 50 males and 20 females. In the 21-30 age group, the highest number of variants was observed (39%) mainly (86%) due to deviation of the nasal septum, followed by agger nasi cells (56%), supraorbital cells (42%), concha bullosa (26%), frontal sinus hypoplasia (22%), pterygoid plate pneumatization (21%), Haller cells (19%), Onodi cells (19%), anterior clinoid pneumatization (18%), crista gallipneumatization (18%), paradoxical middle turbinate (9%), maxillary sinus septations (8%), maxillary sinus hypoplasia (5%), frontal sinus hyper-pneumatization (4%), maxillary sinus hyper-pneumatization (2%). A minimum of one anatomical variant was seen in all the case included in the study. We also observed that most of the cases in our study population showed more than one anatomical variant.

Discussion

Deviated Nasal Septum

A variety of studies have found that nasal septum deviations range between 18% and 80%. According to Tiwari, et al., 88.2% of the study population had a deviated nasal septum [33]

whereas Farhan, et al. report 85% of the study population with a deviated nasal septum. In our study of 50 patients, 86% have deviated nasal septums, which is very close to other studies. The number of patients with hypoplasia of the frontal sinus in our study was 22%, higher than the 15% seen in the study by Devareddy et al [4].

Concha Bullosa

Farhan, et al. observed 33% of participants with concha bullosa in their study, which is slightly higher than the 4% seen in our study of frontal sinus hyperpneumatization.

[5].

Paradoxical

The rate of rotation of the middle turbinate we reported is 9%, 5% bilaterally and 2% right and left, which is significantly lower than the rate reported by Dua et al. In other studies, paradoxical rotation of the middle turbinate was reported in 14% - 25% of cases [6]

Agger Nasi Cells

There have been numerous studies showing the presence of Agger nasi cells, varying from 10 to 98.5% of cases. Another study by Devareddy et al. reported Agger nasi cells in 26% of population studied by Talaiepour AR, et al., found 56.7% of cases contained Agger nasi cells. Agger nasi cells were found in 56% of our study population, which is similar to the study by Devareddy and his colleagues, in which 49% of the study population was bilaterally affected [7].

Onodi Cells

Agger nasi cells have been found in varying percentages of cases, ranging from 10 to 98.5%. In a study by Jain et al., 26.7% of cases contained Agger nasi cells. In a study by Talaiepour AR, et al., 56.7% of cases contained Agger nasi cells. In our study population, 56% of

participants were affected with Aggen Nasi cells, in line with the study by Devareddy and his colleagues in which 49% of participants showed bilateral involvement [8].

Supraorbital Ethmoidal Cells

In their study, Souza, et al. report 35% of students have supraorbital ethmoidal cells, which is lower than our study's report of 42%. 34% of our study participants were bilaterally affected. It has been reported that Carlos, et al. found 69.1% of supraorbital ethmoidal cells in his study [9].

Crista Galli Pneumatisation

Compared to Shpilberg et al., who reported 9.9% cases, and AmitaKumari et al., who reported 8.3%, we report 18% in our study [10].

Variations In Sphenoid Sinus Septa

Among Turkish populations, Battal, et al. reported 64.3% with single intersphenoidal septums, and 32.1% with multiple intersphenoidal septa. As reported by Farhan, et al., 72.3% of the subjects had only one intersphenoidal septum, and 24.5% had more than one intersphenoidal septum, or accessory intersphenoidal septums. In 54% of cases, there was a single intersphenoidal septum and in 46%, there was a multiple intersphenoidal septum. Twenty percent of the patients in our study had sphenoid sinus septa attached to their ICAs, of which six percent were found on the right, eight percent on the left, and six percent were found bilaterally. Compared to Farhan, et al., our results indicate that 13.1% of subjects have sphenoid sinus septa attached to the ICA, with 3.8% on the right, 4.6 % on the left, and 4.6% bilateral [11].

Sphenoid Sinus Pneumatization Pattern

In our study, the most common variant is the sellar variant which accounts for 82% of cases, the presellar variant for 14%, and the shell variant for 4%. As a result of pterygoid process pneumatization in our study, 21% of the study population is found to be pneumatized. According to Shpilberg, et al., 27.1% of the population lives outside of cities. According to our study, 7% of patients show pneumatization on the right side, 7% on the left side, and 7% on both sides [12].

Conclusion

Several anatomical variations are found in the nasal cavity and paranasal sinuses in this study. In radiologic examination of the paranasal sinuses, computed tomography is the gold standard, whether it is used to diagnose sinonasal lesions or to assess them before and after surgery. The ability to differentiate anatomical variants around paranasal sinuses provides protection from recurrent extramural diseases and iatrogenic injury to essential structures. The acquisition and adequate review of computed tomography of the paranasal sinuses in three dimensions are of utmost importance.

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