

Anatomical Variations of Maxillary Air Sinuses on Computed Tomography among Sudanese People

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ABSTRACT----

Background: *the maxillary sinus variations are common among populations. These variations may associate with inflammatory diseases like sinusitis or other diseases (allergic rhino-sinusitis and bronchial asthma).*

Aim: *The aim of this study was to investigate maxillary sinus variations by using CT images in adult Sudanese population.*

Methods: *This was observational descriptive cross sectional study conducted in Khartoum state- Sudan from June to Dec 2014. The study was done in 30 volunteers. All participants underwent head CT scans and sagittal and coronal slices were obtained. Participants were healthy persons without history of head or face trauma or sinus operation history.*

Results: *Mucosal thickening was the most prevalent abnormality (66.7%), followed by antral septa (23.3%), obliterated sinus (16.6%) and mucosal polyp (3.3%). No significant differences were found between males and females regarding the maxillary sinus anatomical variations.*

Conclusion: *variations of maxillary sinus emphasize how important it is for the dentomaxillofacial radiologist, otolaryngologists, radiologist and anatomists to be aware about the anatomical variations of the maxillary sinuses.*

Anatomical variations of maxillary air sinuses are common and may be a predisposing factor for sinus and upper respiratory tract diseases. Studies of these variations and abnormalities were done in many countries worldwide but no studies were done among Sudanese. This study represents a data base about maxillary sinus in Sudan. Further studies are needed including large sample number for more evaluation and analysis.

Keywords---- Maxillary, Sinus, Anatomical variations, Sudanese.

1. INTRODUCTION

Paranasal sinus anatomy and variations have gained interest with the introduction of functional endoscopic sinus surgery and the concept of the ostiomeatal complex [1].

The maxillary sinus is the space within the body of the maxilla, known in earlier days as the maxillary antrum. The sinus is pyramidal in shape, the base at the lateral wall of the nose and the apex in the zygomatic process of the maxilla. The roof of the sinus is the floor of the orbit. The floor of the sinus is the alveolar part (tooth-bearing area) of the maxilla. Anterior and posterior walls are the corresponding walls of the maxilla. Certain ridges appear within the cavity; a constant one is at the junction of roof and anterior wall, produced by the downward passage of the infraorbital nerve with in its canal[2].

The maxillary sinus is present at birth, but is no more than a shallow slit, slightly overgrown into a short culde- sac anteriorly and posteriorly. It excavates the lateral wall of the nose, beneath the middle concha, and lies just beneath the medial side of the floor of the orbit. The body of the neonatal maxilla lateral to this is full of developing teeth. The sinus varies in size; a large one may extend into the zygomatic process of the maxilla and into the alveolar process so that the roots of the three molar teeth (and possibly of the premolars also) lie immediately beneath the floor or project into it. The ostium of the sinus is high up and well back on its nasal wall. It is 2-4 mm in diameter. (A second smaller ostium often lies posteriorly.) It opens at the posterior end of the semilunar hiatus in the middle meatus of the lateral wall of the nose. A precise knowledge of the anatomy of the paranasal sinuses is essential for the clinician. Conventional radiology does not permit a detailed study of the nasal cavity and paranasal sinuses, and has now largely been replaced by computerized

topographic (CT) imaging. This gives an applied anatomical view of the region and the anatomical variants that are very often found. The detection of these variants to prevent potential hazards is essential for the use of current of endoscopic surgery on the sinuses [3]. . Computed tomography (CT) images allow the location of anatomic structures and provide information about bone dimensions and morphology, data of great importance for dental implant planning [4]. Variations of the nasal cavity and paranasal sinuses are very important for the otolaryngologist in functional endoscopic sinus surgery.

one of these variations is maxillary sinuses septa and they are thin walls of cortical bone present within the maxillary sinus, with variable number, thickness and length. Such septa may divide the sinus into two or more cavities arising from the inferior and lateral walls of the sinus. Septa originating from teeth may be classified according to their development at the different phases of the dental eruption. Another variation is accessory maxillary ostia they are generally solitary, but occasionally may be multiple. Such variation may be congenital or secondary to sinus diseases.

Also there is variation which is hypoplasia of one maxillary antrum which is present in up to 0.3% of the population [3,4].

Also mucosal elevation as the adult sinus varies in size; a large one may extend into the zygomatic process of the maxilla and into the alveolar process so that the roots of the three molar teeth (and possibly of the premolars also) lie immediately beneath the floor or project into it. The roots are usually enclosed in a thin layer of compact bone; when this is absent the apex of the root is in contact with the mucous membrane [1,2].

2. METHODS

This was observational descriptive cross sectional study conducted in Khartoum state- Sudan from June to Dec 2014. The study was done in 30 volunteers after formal written consent approved by the local ethical committee. All participants underwent head CT scans and sagittal and coronal slices were obtained. Participants were healthy persons without history of head or face trauma or sinus operation history.

3. RESULTS

Thirty axial and coronal CT radiographs of the persons were studied to evaluate the maxillary air sinuses, out of 30 participants, 23 were females and 7 were males, of different age groups and from different origin and occupations.

Regarding the right maxillary air sinus, mucosal thickness was observed in 12 persons (40%), 4 persons (13.3%) showed sinus septum, one person (3.3%) showed obliterated sinus and one showed mucosal polyp, and 12 (40%), persons radiographs were normal. See table (1).

In the left maxillary air sinus mucosal thickness was observed in 8 persons (26.7%), 3 persons (10.0%) showed septum, 4 persons (13.3%) obliterated sinuses, and 15 were normal. See table (2).

Fifty percent of study group showed symmetrical maxillary sinus of both sides.

Mucosal thickness was observed to be more common between the ages 31 to 50 years of both Rt and Lt sinuses.

No significant relation was found between the anatomical variations of the maxillary sinus and the gender, age, residency, occupation.

Table (1); Right Maxillary Air Sinus distribution Among the Study Group:

| MAXILLARY.RT | Frequency | Percent |
|---------------------|------------------|----------------|
| Normal | 12 | 40.0 |
| Obliterated | 1 | 3.3 |
| Septated | 4 | 13.3 |
| Mucosal thickness | 12 | 40.0 |
| Polyp | 1 | 3.3 |
| Total | 30 | 100.0 |

Table (2); Left Maxillary Air Sinus distribution Among the Study Group:

| Maxillary Lt sinus | Frequency | Percent |
|--------------------|-----------|---------|
| Normal | 15 | 50.0 |
| Obliterated | 4 | 13.3 |
| Septated | 3 | 10.0 |
| Mucosal thickness | 8 | 26.7 |
| Total | 30 | 100.0 |

4. DISCUSSION

Anatomical variations, in association with their inherent conditions, were found to be risk factors for many respiratory tract pathological conditions. Therefore, identifying these variations has recently been critical for clinical practice. Paranasal sinus anatomy and variations have gained interest with the introduction of functional endoscopic sinus surgery and the knowledge of anatomical variations is most important in the surgical management and specifically in the prevention of complications. The acquisition of an excellent definition of the sinus anatomy for a preoperative endoscopic evaluation can be done by means of computed tomography that is the gold standard in the study of such structures, for providing accurate information on soft tissues, bone structures and air, thus characterizing a highly sensitive imaging.

Discussion regarding the prevalence and clinical significance of maxillary sinus bony anatomic variations and mucosal abnormalities is included as a guide to assist the otolaryngologist, radiologist and maxillofacial surgeons in the evaluation of coronal sinus CT scans method.

In this study, the mucosal thickening was found to be the most common abnormality (40%) of Rt maxillary sinus and (26.7%) of Lt maxillary air sinus.

This result agrees with a study done in Brazil by Rege et al [5] who found mucosal thickening was the most prevalent abnormality (66%), and also agrees with Lana et al [6] who detected (62.6%) . A study by Lana et al[6] found that It is important to emphasize that antral septa, detected in almost half of the CT exams evaluated, might increase the risk of sinus membrane perforation during the maxillary sinus floor elevation surgery which can lead to development of acute or chronic sinusitis. This study agreed with him as we detected antral septa in (13.3%) of Rt maxillary sinus and (10.0 %) of Lt maxillary air sinus.

Obliterated sinus showed in the Rt maxillary sinus (3.3%) and (13.3%) of Lt maxillary air sinus this result agree also with Lana et al who detected (1.8%). Mucosal polyp (3.3%) showed in the Rt maxillary sinus, less than Lana et al [6] who detected (21.4%).

The anatomical variations detected in this study were observed in normal persons without any symptoms of sinusitis, thus the presence of anatomic variations singly or in combination, does not represent a disease state.

Table (3) below shows a comparison between the results of the present study and previous studies done worldwide.

Table 3; Comparison between present study and other studies about maxillary sinus anatomical variations:

| different studies | mucosal thickening | Presents of septum | Obliterated sinus | Mucosal polyp |
|-------------------|--------------------|--------------------|-------------------|---------------|
| Rege et al[5] | 66% | | 7.8% | 5.6% |
| Lana et al[6] | 62.6% | 44.4% | 1.8% | 21.4% |
| Cha J[7] | 70.4% | 6.6% | 25.4% | |
| Present study | 66.7% | 23.3% | 16.6% | 3.3% |

5. CONCLUSION

Variations of maxillary sinus emphasize how important it is for the dentomaxillofacial radiologist, otolaryngologists, radiologist and anatomists to be aware about the anatomical variations of the maxillary sinuses.

Anatomical variations of maxillary air sinuses are common and may be a predisposing factor for sinus and upper respiratory tract diseases. Studies of these variations and abnormalities were done in many countries worldwide but no studies were done among Sudanese. This study represents a data base about maxillary sinus in Sudan. Further studies are needed including large sample number for more evaluation and analysis.

6. RECOMMENDATION

Otolaryngologists, dentists, radiologist and anatomists should be aware about the anatomical variations of the maxillary sinuses. CT sinuses are mandatory for patients undergo endoscopic sinus surgery to avoid complications due to anatomical variations of the sinuses.

7. REFERENCES

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