

Anatomical Variation of Sinuses and their Implications in Surgery

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LETTER

The anatomical variations in the tissues associated with the sinonasal inflammation need to be studied in great detail such that the surgeries are customized and to ensure that there are no further complications or reoccurrence of such inflammations. Failure to identify such variations could lead to surgical complications and further deterioration of the condition.

Large scale cross-sectional studies of the anatomical variations associated with the nose and paranasal sinuses will enable the categorizations and classification of different types and aid in substantial improvement and optimization of the procedures for safe and effective endoscopic sinus and skull based surgeries. Non-contrast computed tomography scans is most appropriate for the detection of anatomical variations in the nose, PNS and anterior skull base and it is easy to diagnose and identify the differences in efficient manner. CT scans enable large scale screening of the affected populations as it is non-invasive, safe and effective.

The most common variation is the differences in the DNS and the differences associated with the optic nerve dehiscence degree. In fact consultation based on multiple radiologists is also important to derive the most reliable interpretations and analyze the differences. All the conflicts arising out of the diagnosis must be resolved through mutual consensus. However these diagnoses need to be categorized into different demographic, age, gender and physiological groups. There is also a possibility of each patient being different in the anatomical arrangement due to differences in the genetic and environmental factors particularly among the adults.

One of the most common variations is the abnormality associated with the deviation in the nasal septum and it is observed in almost eighty to ninety percent of the patients. The second most common variation is the inferior nasal turbinate hypertrophy followed by agger nasi cells. Another important variation that is observed is the variation in the optic nerve of type I and kerns type II in terms of the olfactory depth.

Among different races and ethnic groups the osteomeatal complex and its anatomy situated at the lateral wall of the nose shows great deal of anatomical variation. This necessitates the mandibular study of the surgical anatomy in this particular area for studying the differences among the populations. Studies have been conducted to identify the shape, variations, of the middle turbinate, distances, posterior extent measured between the three turbinate's as well as the site of opening of the maxillary sinus ostium. Nearly eighty percent of the samples showed type I shape of the middle turbinate. In about ninety percent of the samples the middle turbinate ended more posteriorly than inferior turbinate. In about sixty percent of the samples, ostium maxillary opened in the posterior one third of the middle meatus. The study observed that the anatomical variations were substantial when compared to the Korean populations.

The study of these variations are important for the neurologist, ophthalmologists, otolaryngologists as well as the oral and the maxillofacial surgeons in the surgical procedures where the middle meatus and the osteomeatal complex is used as a gateway to reach the surgical regions. Highly variable anatomy was with regards to the lateral wall of the nasal cavity where the inferior turbinate develops as a separate bone.

In the recent years the endoscopic end nasal transsphenoidal approach to the pituitary gland gained popularity and is in fact replacing the microsurgical transept and sublabial transphenoidal approaches due to improved visualization and illumination of the operative field. The neurosurgeons performing endoscopic pituitary surgery face the challenges of the anatomical variations of the nose. Due to these variations the neurosurgeons perform the surgery in collaboration with the rhinological surgeons ENT specialists. Therefore, the evaluation of the anatomical variations becomes very significant to perform precise surgeries. In nearly fifty percent of the patients the anatomical variations were associated with spinae septi and the deviations of the septum. In few patients accounting to nearly five percent the bi nostril approach needed to be converted to the mononostril approach. The anatomical variations in about twenty percent of the patients led to the correction. These findings show that the end nasal anatomical variations are very common but they do not necessarily pose any obstacle to the surgical procedures including endoscopic endonasal transsphenoidal approach to the pituitary gland as there is fluoroscopy or electromagnetic navigation available.

Some of the most substantial anatomical variations can be observed in the nasal cavity and the paranasal sinuses. These anatomical variations hinder the mucociliary drainage pathway of the osteomeatal complex. Osteomeatal complex is the most important for the spread and pathogenesis of rhinosinusitis hinder the movement of the cilia resulting in the collection of the mucous within the sinuses. The anatomy of the nasal and the paranasal sinuses can be now studied in much detail using functional endoscopic sinus study and the radiographic computed tomography scanning.

The Para nasal sinuses are the air-filled cavities that are present in the facial and skull bones. These are named as sinuses due to the bones in which they are located for example the sphenoid sinus, maxillary, ethmoidal and frontal sinus. These Para sinuses are essential for the humidification of the head, enable voice resonance, and reduce the weight of the head. The computed tomography diagnosis revealed that there several anatomical variations in the Sino nasal region. The most frequent variations are agger nasi cells (located in the anterior and infer lateral to frontal access), deviation of the nasal septum, infraorbital ethmoidal cells (located underneath the medial floor of orbit adjacent to ostium of the maxillary sinus), sphenoidal cells and concha bullosa cells. It is important to identify the anatomical variations as lack of such understanding can lead to complications during the surgery.

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