Methods

IRB approved study consisting of a retrospective review of CT scans of the face and sinuses, obtained for reasons other than sinus disease. Images were collected over a three month period from January to March 2011 (n=178). The CT scans comprised of 0.625 mm axial images reconstructed into triplanar view. Exclusion criteria included age younger than 18 years, prior sinus surgery, poor quality CT, ethmoid inflammation, or trauma.

CT review was performed independently by two researchers. Each CT scan was visualized using Carestream Imaging (Toronto, Canada) in a triplanar bone window view displaying sagittal, coronal, and axial sections simultaneously. In the coronal plane, the distance between the lamina papyracea and middle turbinate was bisected (Fig 1), and it was the resultant sagittal section at this point that was used for measurements. This method corresponds to the anatomy seen during FESS.

A transition point (TP) of the MTBL was determined as defined as the junction of the horizontal and vertical portions of the basal lamella on sagittal view. The angle from the nasal floor to TP comprised the maxillary crest as the inferior ray, the nasal vestibule as the vertex, and the linear trajectory from the vestibule to the transition point as the superior ray (Fig 2, A). The distance from TP to the skull base was measured as the height extending from the TP to the skull base/ethmoid roof and perpendicular to the nasal floor (Fig 2, B). The distance from the nasal floor to TP was calculated as the length of the line perpendicular to and originating from the hard palate and ending at the TP (Fig 2, C).

In the sagittal window, these 3 variables were measured bilaterally.

Discussion

Prior investigators studied sinus anatomy and applied it to pre-surgical evaluation with the goal of preventing surgical complications such as Keros’s work from 1965 which is well known for its three-tier classification for the depth of the cribiform plate (1). However, little work has been performed to define the posterior ethmoid height.

Zacharek and colleagues (2) measured ethmoid roof height along sagittal and coronal planes. On sagittal view, the ethmoid roof height was measured at five points in relation to the nasal floor. The investigators noted that while anterior ethmoid height was lower on the right, the posterior ethmoid roof was more consistent and equal.

Elwany et al (3) defined posterior ethmoid height from the nasal floor at the junction of the cribiform plate and anterior edge of the planum sphenoidale. Their radiographic review revealed mean ethmoid height values ranging from 47.9 to 52.9 mm. In comparison, we found an average height of 45.85 mm on the right and 45.92 mm on the left; however, our measurements were taken at a more anterior location, using an established landmark.

Our study represents a radiographic retrospective analysis of skull base height at the posterior ethmoid sinus. We centered our measurement on the transition point of the middle turbinate because this serves as the surgical landmark for entry into the posterior ethmoid sinus. The advantage of using a surgical reference measurement point makes our results more applicable to clinical practice compared to prior studies. To our knowledge, no other study has published normal values for skull base height in relation to the transition point of the horizontal and vertical basal lamella.

Conclusion

Understanding anatomy is paramount to performing safe endoscopic sinus surgery. This study approached the measurement of the skull base height in terms of posterior ethmoid height in relation to the transition point of the basal lamella as well as established normal values for the angle from the nasal floor to the transition point and the distances from this point to the nasal floor and ethmoid roof. These norms serve as useful guidelines in planning sinus surgery.

References


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