

## Frontal sinus drainage pathway and uncinata process: a single morphofunctional unit with a complex anatomy

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The aim was to study the anatomical variability of the frontal sinus (FS) drainage pathway (FSDP), the uncinata process (UP) and the relative air spaces. For this purpose, 14 human heads were endoscopically dissected after a cone-beam CT scan. Several features were assessed both radiologically and in the lab setting. Most of the anatomical features were classified according to the Bent and Kuhn classification modified by Wormald (1). The FSDP was medial to the UP in 82% and lateral in 18% of the cases. The Agger-Nasi Cell (ANC) was found in 100% of cases, a supraorbital pneumatization in 71.5%, a frontal bulla in 14%, a suprabullar cell in 78.5%, a suprabullar recess in 23%, an inter-frontal-sinus septal cell in 14%, a concha bullosa in 28.5% of cases. The frontoethmoidal Kuhn cells (K cells) were absent in 32%, type 1 was found in 39%, type 2 in 25%, type 3 in 4% and type 4 in no one case. The medial location of the FSDP respect to the UP was found to correlate with the presence of type 1-4 K cells, while the lateral location significantly correlated with the suprabullar recess, which was mostly absent when a suprabullar cell was present. The results of this study should be explained considering the development of the FS based on the description of frontoethmoidal area by Terrier et al. (2) In fact, when the FS arises from a "nasal cell", the FSDP is medial to the UP and K cells develop, as resulted in the present study; on contrary, when the FS arises from an "orbital cell", the FSDP is lateral to the UP and no K cells are found. Furthermore, when the FS develops from a "bulla cell", the pneumatization occurs laterally to the UP. This fact should be explained considering the correlation between the suprabullar recess, which is a sign of "bulla cell" origin, and the lateral location of the FSDP. In conclusion, this data could also support and explain the presence and formation of several other anatomical variations, such as the frontal bulla and the inter-frontal-sinus septal cell.

### References

- [1] Wormald (2005) Surgery of the frontal recess and frontal sinus. *Rhinology* 43: 82.
- [2] Terrier et al. (1985) Anatomy of the ethmoid: CT, endoscopic, and macroscopic. *AJR Am J Roentgenol* 144: 493.

### Keywords

Frontal sinus; frontal sinus drainage pathway; cadaver dissection; endoscopy.