Relevance of sinonasal anatomical variations in the preoperative evaluation by computed tomography for endonasal surgery

Importância das variantes anatômicas nasossinusais na avaliação pré-operatória por tomografia computadorizada da cirurgia endonasal

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Endonasal surgery is utilized in diagnosis, biopsy, management and follow-up of several sinonasal diseases. In order to perform this procedure with the appropriate safety, preventing iatrogenic lesions, it is essential that the surgeon can preoperatively rely on an appropriate mapping of bone structures involving the nasal fossae, paranasal cavities and their drainage pathways. The imaging method of choice for this evaluation is computed tomography (CT), considered as the golden-standard, based on the evaluation of axial, coronal and sagittal images. Coronal images can be directly acquired, preferentially with the patient in ventral decubitus, or otherwise being reconstructed from axial images. Spiral, and especially multislice CT equipment allow multiplanar image reconstruction with a quality similar to the images directly acquired in the coronal plane, with the advantage of eliminating artifacts originated by eventual dental restorations. Sagittal reconstructions supplement the anatomical detailing of paranasal cavities provided by coronal images, especially of frontal sinuses and frontal recess[1].

Anatomical variations involving the ethmoid sinuses are very frequently found. Earwaker, evaluating 800 patients, has observed 52 types of variations involving the nasal fossae and paranasal cavities, with 93% of patients presenting one or more of these variations[2]. Some of the variations have no clinical significance; however, other should be valorized and described, considering that they may be related to the genesis of sinusopathy or even may affect endonasal procedures. For instance, in the frontal recess approach, the presence of some ethmoidal cells may change the anatomy and, consequently, the surgical access such as frontal cell, supraorbital cell, *agger nasi* cell and ethmoidal *bulla* which should be described[3,4].

Another area that should be evaluated is the ethmoidal roof, considering that the perforation of this structure could result in a direct communication with the subarachnoid space, development of liquoric fistula and cerebral parenchymal lesion. In order to avoid this complication, it is necessary that the surgeon has the knowledge of the complex anatomy involving the anterior skull base, including the ethmoid fovea, the ethmoidal cells, the lateral lamella and the route of the anterior ethmoid artery which can be demonstrated by tomography[5,6]. The variability of the ethmoid height is also related to the degree of frontal sinus pneumatization and the presence of frontal cells[7].

The site where the anterior ethmoid artery leaves the ethmoidal labyrinth and goes toward the olfactory fossa represents the area of highest fragility in the anterior skull base and is susceptible to perforation during surgical procedures. Additionally, the anterior ethmoid artery may not be protected by a bone canal. This may occur in the presence of a supra-orbital cell[6,8].

In the present issue, the interesting article "Computed tomography assessment of the ethmoid roof: a relevant region at risk in endoscopic sinus surgery" approaches some anatomical variations related to this region such as asymmetry, fovea ethmoidalis inclination and height of the lateral lamellas. The height of the lateral lamella was evaluated according to the classification proposed by Keros. The authors emphasize the relevance of a criterious evaluation of this region by the

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radiologist, warning the surgeon about risk factors. A higher incidence of ethmoidal roof perforation is reported in cases of asymmetry in the height of the lateral lamella. Lateralization and protrusion of the lateral lamella represent a major risk for perforation[9].

Other anatomical variations which should be described by the radiologist are dehiscence in the lamina papyracea, considering the risk for injury of orbital structures during the surgical procedure, and the presence of Onodi cell[6,10].

Onodi cell is formed by lateral and posterior pneumatization of the most posterior ethmoid cell over the sphenoid sinus, adjacent or even involving the optic nerve, increasing the risk for injury of this nerve during the resection of the cell.

The extension of the sphenoid sinus pneumatization to the anterior clinoid process also increases the vulnerability of the optic nerve during endonasal surgery. Additionally the relationship between the sphenoid sinus and the internal carotid artery should be evaluated, including the bone dehiscence of the carotid canal and the presence of *intersinus* sphenoid septum attached to the carotid canal[6].

The knowledge of the sinonasal anatomical variations by the radiologist is essential, considering their possible involvement in the genesis of sinusitis, changing the anatomy of the region and increasing the risk for eventual iatrogenic complications from endonasal procedures.

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