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ORIGINAL ARTICLE

A quite rare condition: absence of sphenoidal sinuses

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Abstract The absence of sphenoidal sinuses (SS) in an adult is an extremely rare condition. We investigated in agenesis of the sphenoid, maxillary, ethmoid, and frontal sinuses in 20 male adult cadavers. In a 50-year-old man, bilateral absence of the SS was observed. On the macroscopic examination, opening of the SS was not found on the lateral wall of the nasal cavity. There were multiple small mucosal grooves between the sphenoidal rostrum and the superior nasal turbinates. The bulging of the sphenoidal rostrum at the choanal level was flat. The body of the sphenoid bone was normal and consisted of a symmetrical bony structure with a total lack of pneumatization. Other paranasal sinuses agenesis was not observed. Surgeons should also consider the possibility of sphenoidal agenesis before transsphenoidal hypophysectomy. As a supplement to the traditional classification, agenesis of the SS can be described as the fourth type of pneumatization.

Keywords Sphenoid sinus · Absence · Agenesis · Anatomy

Introduction

To treat the disease effectively and avoid complications, otorhinolaryngologist must possess a detailed understanding of paranasal sinus anatomy and its variations [2, 9, 10]. Furthermore, the surgeon must pay attention to the other anatomical risk factors even after the opening has been identified. These factors, include the skull base, which comes into contact with the superior wall of the sphenoidal sinuses (SS), the cavernous sinus touching its lateral border, and the branches of the sphenopalatine artery running along the inferior to the ostium [5, 17]. Despite all these difficulties, not much anatomical research has been dedicated to the location of the opening in the SS.

The absence of a SS is uncommon in adults. Although previous studies have described this incidence as 1–1.5% in the adult age group, all of them were based on the anatomical examination [3, 4, 6, 11, 13]. To our knowledge, only two cases of the SS agenesis were reported in literature. Because the absence of the SS was observed during the dissections, this case and its importance has been discussed.

This situation has not been perceived as a variation because differentiating the types of the SS is clinically important in planning pituitary surgery.

Materials and methods

For this study, dissection was performed on 20 specimens of 50–75 years old male adult cadavers from the Aegean region with no macroscopic pathologies in the orbital and nasal region. There was no known history of a systematic disease affecting the skeletal system or craniofacial abnormalities. The cadaveric heads were hemisected at the concave sides, that is, the wide side of the nasal septum. All the procedures were performed under an operating microscope (Möller Wedel Spectra) equipped with a camera and video system. The use of an operating microscope enabled us to make clear dissections of the lateral nasal wall. Craniofacial structures were evaluated for the absence of the paranasal sinuses bilaterally by the authors of this article and an experienced anatomist (MO). Mucosal structure and the opening

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hole to the paranasal sinuses (sphenoid, maxillary, ethmoid, and frontal) were analyzed.

Results

The opening of the SS was not observed bilaterally only in one 50-year-old male specimen. On the macroscopic examination, opening of the SS was not observed on the any of the sides (Fig. 1a). There were multiple small mucosal grooves between the sphenoidal rostrum and superior nasal turbinates. Bulging of the sphenoidal rostrum at the choanal level was flat. Body of the sphenoid bone was normal and it consisted of a symmetrical bony structure with a total lack of pneumatization.

In 19 specimens, the opening of the SS was located just medial to the inferior portion of the superior nasal turbinate (Fig. 1b).

Cavities related to the maxillar, frontal, and ethmoid sinuses were observed through the paranasal sinuses. The absence was not observed in these sinuses.

Discussion

Three general types of pneumatization of the SS have been described [2, 3, 10, 15]. The first type is the conchal or fetal type, in which only a rudimental sinus is present and is confined to the rostral portion to keep pneumatization at minimal. This is present in only 2.5% of the adults. The second type is called as the presellar type or hypoplastic sinus where the pneumatization extends to the anterior wall of the pituitary fossa. This occurs in 10% of the adults. The third type is the sellar, postsphenoid or occipital type. In this type, the pneumatization extends beyond the tuberculum sella. This is observed in 90% of the cases [5, 12].

The SS cavities are variable in size, and are often asymmetrical [14, 16]. In the fourth fetal month, the SS emerge as evaginations from the posterior nasal capsule into the sphenoid bone and at birth; they become visible as minute (0.5 × 2 × 2 mm) cavities [2]. By the age of 7, they extend posteriorly to the level of the sella turcica, and by the age of 12, sphenoid pneumatization reaches its adult size and the sinuses measure on average 14 × 14 × 12 mm [1, 14, 16].

The lack of any sinus pneumatization by the age of 10 should suggest the possibility of sphenoid pathology [7, 12]. Hajek [8] described "deficient resorption from corpus sphenoidale" as the pathogenesis of absence of the SS. The absence of paranasal sinuses is an uncommon clinical sign and it refers primarily to the frontal sinuses (12%) and secondarily to the maxillary sinuses (5–6%) [1, 7]. The incidence of absence of the SS is reported as 1–1.5% in previous studies [2, 3, 6, 7, 11]. The absence of the SS usually occurs with syndromes, such as craniosynostosis, osteodysplasia and Down's syndrome and has also been reported as Hand–Schuller–Christian Disease [1, 3]. Pneumatization can extend into the greater wing, pterygoid process, and rostrum and the basilar part of the occipital bone [8, 12].

The pathogenesis of absence of the SS has been regarded as the cause of deficient resorption from the body of the sphenoid bone [8]. Keskin et al. [11] pointed out that sphenoidal absence can also be categorized as the fourth type of pneumatization.

Making differentiation between the types of the SS is important clinically in planning pituitary surgery. Transnasal surgery would be difficult and dangerous in conchal or absence of the SS. In such cases, employing other operative techniques might be useful [11].

In our study, we have found that bilaterally absence of the SS was extremely rare. Surgeons should also consider the possibility of sphenoidal absence or a rudimentally SS before transsphenoidal hypophysectomy. As a supplement to the traditional classification, absence of the SS can be described as the fourth type of pneumatization.

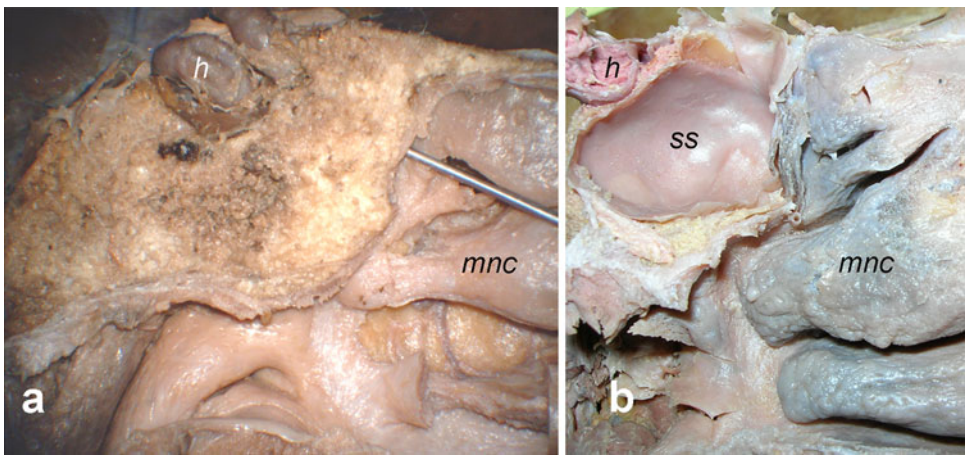

Fig. 1 **a** Absence of the sphenoidal sinus. Probe in the opening of posterior ethmoidal cell, **b** presence of the sphenoidal sinus. *h* hypophysis, *ss* sphenoidal sinus, *mnc* middle nasal turbinate

Conflict of interest statement No financial conflict of interest exists with any commercial entity whose products are described, reviewed, evaluated or compared in the manuscript. None of the authors has a financial interest in any of the product, devices or drugs mentioned in this article.

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