

## Bifid inferior turbinate: a case report

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### Abstract

**Objectives:** A bifid inferior turbinate is an extremely rare anatomical variation and has been reported in only two cases to date. Including the present report, the uncinate processes were missing in all three patients reported. It is suggested that, in the reported patient, bifid inferior turbinate coexisted with a developmental anomaly of the uncinate process, and that the bifid inferior turbinate represented two separate turbinates originating from the same site.

**Case report:** We present the first reported case of bilateral bifid inferior turbinates, with a secondary middle turbinate, in a patient complaining of nasal obstruction.

**Conclusion:** We suggest that the superior part of the bifid inferior turbinate may have been formed by severe medial displacement and inferior rotation of the uncinate process, and that the bifid inferior turbinate is an anatomical abnormality of the uncinate process.

**Key words:** Turbinates; Nasal Cavity; Computerised Tomography

### Introduction

Radiological imaging of paranasal structures has gained importance in parallel with the development of endoscopic surgery of the nose and paranasal sinuses. Computerised tomography (CT) is most commonly employed for this purpose. Anatomical variations of paranasal structures may present confusing surgical landmarks. Thus, the surgeon must be informed of their presence prior to surgery, in order to avoid possible complications.

Concha bullosa (i.e. pneumatisation of the middle turbinate) and paradoxical middle turbinate are the most frequent anatomical variations of the turbinates encountered in paranasal CT scanning. Other, less frequent turbinate variations include accessory middle turbinate, secondary middle turbinate, and pneumatisation of the superior and inferior turbinates.<sup>1–5</sup> The incidence of secondary middle turbinate is reported as 1.5–6.8 per cent.<sup>4,5</sup>

Bifid inferior turbinate is an extremely rare variation and was first described by Aksungur *et al.*<sup>6</sup> Only two cases of bifid inferior turbinates, one bilateral and one unilateral, have been reported in the literature.<sup>6,7</sup>

This paper presents a case of bilateral bifid inferior turbinates and a unilateral secondary middle turbinate in a patient complaining of nasal obstruction.

### Case report

The literature was reviewed using the Entrez PubMed website. The search used the following key words: 'inferior turbinate', 'paranasal', 'anatomic variation', 'bifid' and 'uncinate'. In addition, textbooks of rhinology were searched.

A 40-year-old man was seen in the otolaryngology out-patient clinic in July 2006, complaining of nasal obstruction.

The patient was observed to have a nasal septal deviation towards the right side on anterior rhinoscopy.

Fine section, coronal, paranasal CT revealed bilateral bifid inferior turbinates and bilateral lamellar concha bullosae (Figures 1a to 1e). A secondary middle turbinate was also seen (Figure 2). The uncinate processes were missing bilaterally (Figures 1c and 1d). Bilateral mucous retention cysts in the maxillary sinuses were also observed on the CT.

Endoscopic nasal examination revealed bilateral bifid inferior turbinates with hypertrophy of the inferior portion on the left.

The patient underwent septoplasty and radiofrequency ablation of the inferior portion of the left inferior bifid turbinate.

At the time of writing, the patient was symptom-free at six months' follow up.

### Discussion

The nasal turbinates are composed of bone and overlying soft tissue, and they extend from the lateral nasal wall into the nasal cavity. The supreme, superior and middle turbinates are parts of the ethmoid bone, while the inferior turbinates are a pair of independent bones.<sup>3</sup>

Embryologically, precursors of human turbinates can be distinguished as prominences extending from the lateral nasal wall in the eighth to tenth weeks of fetal life, and are termed the ethmoturbinals and maxilloturbinals.<sup>3</sup> The inferior and the middle turbinates have different embryological origins. The middle turbinate takes its origin from the second ethmoturbinal, while the inferior turbinate develops from the maxilloturbinal. The uncinate process takes its origin from the first ethmoturbinal.<sup>3</sup> The grooves between the turbinals lead to the formation of the recesses and the sinuses.

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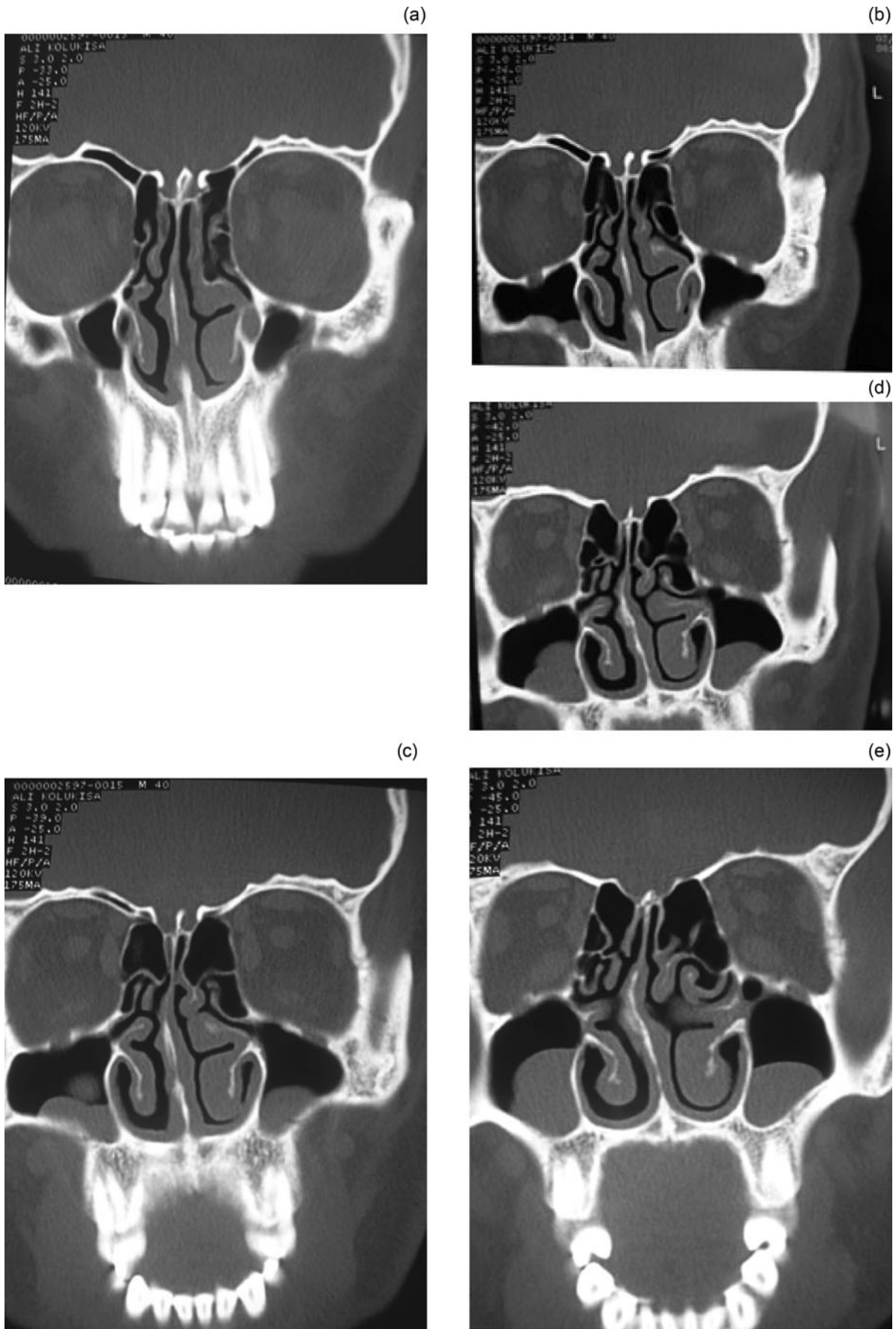


FIG. 1

Serial sections of coronal computed tomography scan, showing bilateral bifid inferior turbinate and the absence of bilateral uncinat process.



FIG. 2  
Left secondary middle turbinate (arrow).

Currently, reported variations of the turbinates include turbinate pneumatization, paradoxical middle turbinate, secondary middle turbinate, accessory middle turbinate and bifid inferior turbinate.

Although bullous and paradoxical middle turbinates are frequently encountered variations, a secondary middle turbinate is rather rare. The secondary middle turbinate is thought to develop as an evagination of the lateral nasal wall.<sup>4</sup> It has not previously been reported in a patient with bilateral bifid inferior turbinates.

Bifid inferior turbinate has previously been reported in only two cases. It was described for the first time by Aksungur *et al.*<sup>6</sup> in 1999. Their case had a unilateral bifid inferior turbinate and bilateral secondary middle turbinates; the uncinata process on the side of the bifid inferior turbinate was also missing. The other case reported had bilateral bifid inferior turbinates and did not have any variations of the middle turbinate; however, the uncinata processes were missing bilaterally.<sup>7</sup> Our patient had bilateral bifid inferior turbinates and a unilateral secondary middle turbinate. Similar to the other patients with bifid inferior turbinates, our patient's uncinata processes were absent bilaterally. Our case represents the first report of bilateral bifid inferior turbinates with a unilateral secondary middle turbinate.

- This case report describes the first case of bilateral bifid inferior turbinate with unilateral secondary middle turbinate
- Bifid inferior turbinate is an extremely rare anatomical variation
- It is hypothesised that the bifid inferior turbinate is an embryological variation of the uncinata process

In all of the reported cases with bifid inferior turbinates, including our own, it is noteworthy that the uncinata processes were missing on the sides of the bifid inferior turbinates. Aksungur *et al.*<sup>6</sup> suggested that bifid inferior turbinate coexisted with a developmental anomaly of the uncinata process, and that bifid inferior turbinates represented two separate turbinates originating from the same site. If this hypothesis is true, two anatomical abnormalities existed together, although the uncinata process and the inferior turbinate embryologically

develop from two distinct structures as discussed earlier. In Spear and colleagues' stated that the upper lobe of the bifid inferior turbinate could have originated as the uncinata process, which then differentiated into turbinate-like structure.<sup>7</sup>

The fact that the uncinata processes were missing in all reported cases with bifid inferior turbinates, and that the uncinata process and the inferior turbinate have different embryological origins, prompts one to question whether the superior portion of the bifid inferior turbinate could be an anatomical abnormality of the uncinata process. When we examined our patient endoscopically and assessed the CT images of the superior portions of the bifid inferior turbinates, we speculated that the superior part of the bifid inferior turbinate may have been formed by severe medial displacement and inferior rotation of the uncinata process. This hypothesis would also explain why the uncinata process was missing in all reported cases of bifid inferior turbinates.

### Conclusion

Bifid inferior turbinate is an extremely rare anatomical variation which possibly arises during embryological development of the lateral nasal wall. It is characterised by the presence of two turbinates in place of the single, inferior turbinate and is diagnosed by paranasal sinus CT and endoscopic nasal examination. Our case represents the first published report of bilateral bifid inferior turbinates coexisting with a unilateral secondary middle turbinate.

The literature review revealed that all reported cases of bifid inferior turbinates were associated with an absent uncinata process. This finding supports the idea of inferior turbinate duplication as a variation originating from the uncinata process.

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