

## Trifurcate middle turbinate; an unusual anatomical variation\*

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### SUMMARY

*Anatomical variations of supernumerary middle turbinates include a secondary middle turbinate, which is a bony projection arising from the lateral nasal wall and covered by soft tissue, and an accessory middle turbinate, which is a medially bent uncinete process. Although pneumatization of the middle turbinate is common, inferior turbinate pneumatization is very rare. We report what we believe is the first case of a middle turbinate split into three divisions, i.e. trifurcated. This co-existed with a pneumatized inferior turbinate.*

*Key words: trifurcate middle turbinate, bifurcate middle turbinate, secondary middle turbinate, accessory middle turbinate, pneumatized inferior turbinate*

### INTRODUCTION

Anatomical variations are commonly encountered in the paranasal sinus area. Pneumatization of the middle turbinate is the commonest of these <sup>(1)</sup>. Secondary middle turbinate is a rare variation first described by Khanobthamchai et al as a bony projection originating from the lateral wall of the middle meatus and covered by soft tissue <sup>(2)</sup>. Accessory middle turbinate is another variation where the uncinete process is medially bent and anteriorly folded resembling a middle turbinate <sup>(3)</sup>. Pneumatization of the inferior turbinate is an extremely rare variation which has been reported 12 times in the literature <sup>(4)</sup>. We report what we believe is the first case of a middle turbinate split into three divisions, which we named "trifurcate middle turbinate". This variation co-existed with a

pneumatized inferior turbinate.

### CASE REPORT

A 76-year-old Caucasian lady presented to us with a history of several years of postnasal discharge, intermittent headache and pain over the right cheek. The patient denied any symptoms of nasal obstruction. Her past history included a hiatus hernia controlled by proton pump inhibitors. Anterior rhinoscopy revealed hypertrophy of the right inferior turbinate. Rigid nasendoscopy showed that both middle turbinates were paradoxical. Interestingly, it also revealed three middle turbinates on the right side with a common superior origin (Figure 1). A coronal C.T scan confirmed that the right middle turbinate was paradoxical and split into three divisions (Figures 2 and 4). The

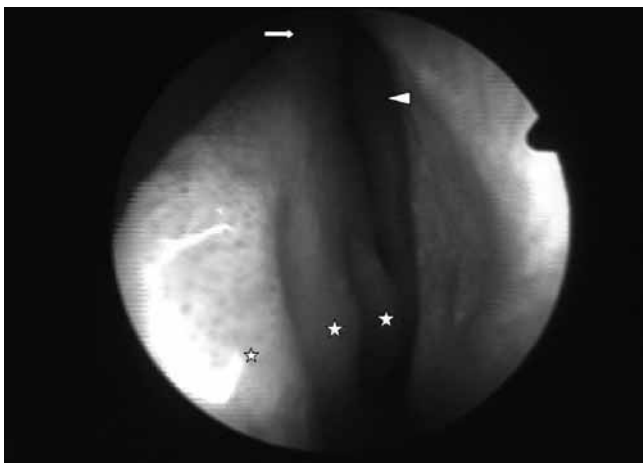


Figure 1. Trifurcate right middle turbinate (endoscopic view). An endoscopic view of the right nasal cavity using 4 mm 0° rigid scope showing the right middle turbinate to be split into 3 divisions i.e. trifurcated (stars) with a common superior origin (arrow). The superior turbinate is seen posterior to the middle turbinate 3<sup>rd</sup> division (arrow head).



Figure 2. Trifurcate right middle turbinate (C.T). Coronal C.T. scan showing the right middle turbinate to be split into 3 divisions i.e. trifurcated (arrows) with a common superior origin.



Figure 3. Bifurcate left middle turbinate (C.T). Coronal C.T scan showing the left middle turbinate to be split into 2 divisions i.e. bifurcated (arrows) with a common superior origin. Middle turbinates are paradoxical bilaterally (arrow heads).

left middle turbinate was also paradoxical and split into two divisions (Figure 3). Moreover, the right inferior turbinate was pneumatized (Figure 4). All paranasal sinuses were clear. The uncinate processes bilaterally were normal. The patient was treated by topical steroid nasal sprays. On the next visit, she was still complaining of the post nasal discharge, but both the headache and the facial pain had resolved. She was offered surgical reduction of the inferior turbinate but she was not keen on any surgery, and preferred to continue using the steroid spray. She was contacted later and reported that her symptoms had improved.

## DISCUSSION

The nasal turbinates are embryologically derived from a series of outgrowths from the foetal lateral nasal wall. The outgrowths form a series of ridges, referred to as “ethmoturbinals”<sup>(5-7)</sup>, which are separated by furrows. Six ridges initially develop, but not all of them become permanent turbinates, as some of them may fuse together. Each ridge has an anterior ascending portion and a posterior descending portion<sup>(5,6)</sup>. The uncinate process develops from the descending portion of the first ridge, which is also known as the “nasoturbinale”<sup>(5,6)</sup>, whereas the agger nasi develop from its ascending portion. The second ridge forms the bulla lamella, or the bulla ethmoidalis when pneumatized. The middle turbinate develops from the third ridge, which is the first permanent ethmoturbinale. The fourth ridge, the second permanent ethmoturbinale, forms the superior turbinate. If another ethmoturbinale persists, it forms the supreme turbinate<sup>(5,6)</sup>. Based upon this, variations in development and pneumatization of the ethmoturbinals may lead to anatomical variations within the bony structures of the ethmoidal complex. On the other hand, the inferior turbinate develops from a non eth-



Figure 4. Pneumatized right inferior turbinate (C.T). Coronal C.T scan showing the right inferior turbinate to be pneumatized (star). Trifurcation of right middle turbinate is seen (arrows). The cut is 3 mm posterior to Figure 2.

moidal structure called “maxilloturbinale”<sup>(5-7)</sup>. This explains the relative rarity of pneumatization of the inferior turbinate compared to the middle and superior ones.

Khanobthamchai et al. were the first to describe the secondary middle turbinate<sup>(2)</sup>. They reported its incidence to be 1.5%. The incidence in other studies ranged from 0.8% - 6.8%<sup>(8,9)</sup>. It was suggested that the secondary middle turbinate was an incomplete anterior wall of the bulla ethmoidalis<sup>(2,3)</sup>. Other workers suggested that it could originate from a frontal ridge which normally formed anterior ethmoidal cells<sup>(8)</sup>. Generally, the secondary middle turbinate is located posterosuperior to the infundibulum and curves medially and superiorly<sup>(2,9)</sup>. Occasionally, it may protrude medially and inferiorly<sup>(8)</sup>. The accessory middle turbinate is a medially bent and anteriorly folded uncinate process<sup>(3)</sup>.

In our case, the middle turbinate on the right side was inferiorly split into three divisions, i.e. trifurcated, giving the appearance of three middle turbinates on one side. To our best knowledge, there has been no report of a similar case before. On the left side, the middle turbinate was also inferiorly split into two divisions, i.e. bifurcated. This variation is different from previously described secondary and accessory middle turbinates.

Pneumatization of the inferior turbinate was considered to be a non existing entity until recently<sup>(6)</sup>. Although Namon described a presumed mucocele of the inferior turbinate in 1995<sup>(10)</sup>, the first unquestionable reports of pneumatized inferior turbinates were made in 1999<sup>(11,12)</sup>. Following this, few reports were made of this condition, the last one by Kiroglu et al in 2007, was the 12<sup>th</sup> report in the literature<sup>(4)</sup>. Our report is the 13<sup>th</sup>.

## CONCLUSION

Multiple anatomical variations can co-exist in the region of the nose and the paranasal sinuses. These variations may have no clinical consequences. However, if functional endoscopic sinus surgery is contemplated, it is of utmost importance that the surgeon be aware of these variations pre-operatively to avoid disorientation during surgery.

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