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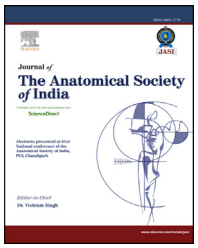

Original Article

# The analysis of intranasal anatomic variations of Korean patients with malocclusion

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ABSTRACT

*Introduction:* There are two important aspects in a relationship between malocclusion and the area of rhinology. First, there is the negative impact of nasal obstruction on normal facial growth. Second, surgical treatment of malocclusion under general anesthesia is chiefly done through nasotracheal intubation.

The aim of this study is to investigate the prevalence of nasal septal deviation and concha bullosa among patients with malocclusion as common anatomical variations that can affect nasotracheal intubation in comparision with previous studies.

*Materials and Methods:* This study was carried out on the subjects of 634 patients who underwent surgery for malocclusion. High resolution computed tomography (CT) taken preoperatively was analyzed and we measured position and angle of septal deviation and classified degree and position of pneumatization of middle concha.

*Results:* Septal deviation was found in 402 patients (63.4%). Concha bullosa was found in 328 patients (51.7%). Both of them were found in 238 patients. Three hundred twenty-five patients had the middle concha bullosa, sorted by type into true (182), lamella (80) and bulbous type (33), while for 30 patients, combination of two or more types were observed.

*Discussion:* This study showed that the frequency of anatomical variations affecting nasotracheal intubation was high in Korean patients with malocclusion. We emphasize that more closely preoperative evaluation is necessary for patients with malocclusion planning on surgery using nasotracheal intubation.



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## 1. Introduction

Recently, as people pay more attention to the shape of teeth from relatively young ages with larger therapeutic and cosmetic desire, surgical treatment is being carried out in numbers on patients with malocclusion.[1,2]

There are two important aspects in a relationship between malocclusion and the area of rhinology. First, there is the negative impact of nasal obstruction on normal facial growth. It has been reported by many researches that large dependence on mouth breathing due to nasal obstruction caused by hypertrophy of adenoids, allergic rhinitis or nasal septal deviation makes difference in dental and facial growth, compared to nasal cavity breathing.[3–5] Patients with nasal obstruction have a long face, large mandibular angles, significant mandibular retraction, and mostly type II malocclusion, compared to those who breathe through the nasal cavity. The same study revealed that in patients with mouth breathing, distance between upper jaw and molar was narrow, cross-bite was frequent, and height of palate and degree of overjet were significantly serious.[3–5]

Second, surgical treatment of malocclusion under general anesthesia is chiefly done through nasotracheal intubation. However, nasotracheal intubation may cause many complications including injury in nasal mucosa and nasopharyngeal mucosa, laceration in adenoids and tonsils, injury in glottis, serious nasal hemorrhage caused by vascular injury such as sphenopalatine artery, bleeding and airway obstruction caused by nasal polyp or movement of intranasal foreign substance, nasal necrosis and laceration caused by excessive strain or flexion, obstruction of nasotracheal tube caused by conchoidal mucosal laceration, and unexpected nasotracheal excision.[6–9] The most common complication of nasotracheal intubation is epistaxis, which occurs with an incidence of 18–60%.[7,10] So, careful assessment of patients prior to nasotracheal intubation is essential. Aberrations of nasal anatomy are common; nasal septal deviations and septal spurs together with hypertrophy of the turbinates.[11] Based on these aspects, the authors analyzed intranasal anatomical structures causing nasal obstruction or difficulties of nasotracheal intubation in patients with surgical treatment after diagnosis with malocclusion in order to elucidate whether patients with malocclusion have more anatomical problems within nasal cavity.

## 2. Materials and methods

This study was carried out on 634 patients who had two-jaw surgery under general anesthesia through nasotracheal intubation after diagnosis with malocclusion at the department of oral and maxillofacial surgery in our hospital. Preoperative high resolution dental CT images were analyzed retrospectively to check the presence or absence of nasal septal deviation and concha bullosa (middle concha, inferior concha) and sort their positions, shapes and degrees. Due to the retrospective nature of this study, it was granted an exemption in writing by the Institutional Review Board of our institute.

Patients who experienced maxillofacial trauma including nasal bone fracture or who had the history of intranasal surgery such as septoplasty, submucosal turbinectomy, endoscopic sinus surgery and rhinoplasty, were excluded from the study subjects. For nasal septal deviation, two experienced rhinologists measured the angle made by crista galli and area of the severest curvature by PACS (Picture Archiving and Communication System; Maroview, Marotech, Seoul, Korea) in blinded manner. If the angle was 5° or more in both of two measurements, we classified as significant deviation (Fig. 1).[12] For concha bullosa, superior concha was excluded because it is small in size, because it is hard to judge through CT whether there is pneumatization with neighboring structures, and because it doesn't affect nasotracheal intubation, which is the core of this study. So analysis was focused on the position and shape of concha bullosa that exists in middle concha and inferior concha. Pneumatization at vertical basal lamella was classified into lamellar type, at bulbous segment of nasal concha into bulbous type, and at the whole nasal concha including basal lamella and bulbous segment into true type (Fig. 2A–C).[13] In the same manner, two experienced rhinologists checked the presence of concha bullosa using PACS.

Hypertrophied inferior concha is an important factor that can have effect on nasotracheal intubation. However, its mucosal hypertrophy and bony hypertrophy can have different sections to practically affect, with unclear criterion to determine degree of hypertrophy, which is likely to bring up different views on how to measure and evaluate, so hypertrophy of inferior concha was not considered in this study.

## 3. Results

### 3.1. *Distribution of patients*

Two hundred thirty-seven patients were males with average age 24.1 (age group from 15 to 55) while three hundred ninety-

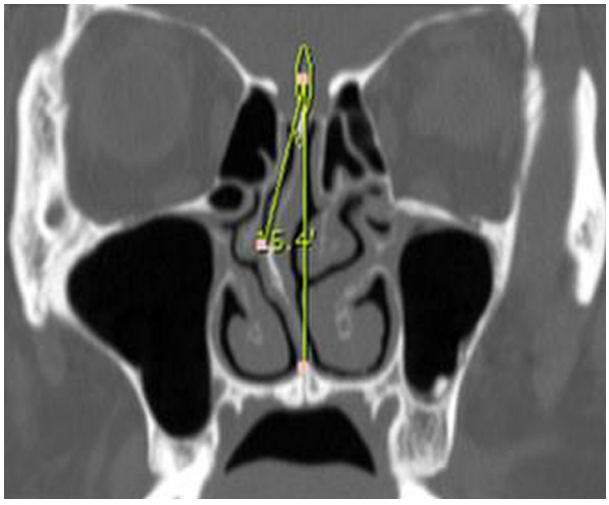


**Fig. 1 – Method of septal deviation measurement with computer-based photo program. The angle between crista galli and the most prominent point of the deviation was accepted as the angle of deviation.**