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Comparison of nasal region dimensions in bilateral choanal atresia patients and normal controls: A computed tomographic analysis with clinical implications

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Summary

Objective: To determine if any difference exists between a set of nasal dimension measurements in choanal atresia patients and in a control group.
Methods: A retrospective study was undertaken to define the variation of values for a series of nasal dimension measurements through axial computed tomography in 9 patients with bilateral choanal atresia and compare the same dimensions with a control group 104 patients of similar gender and age distribution. The statistical significance of the differences in these dimensions was examined.
Results: Nine of 17 variables showed a significant difference between normal and choanal atresia group. The result showed that the growth of the nasal complex can be influenced by nasal obstruction.
Conclusion: These findings might serve in understanding the differential growth patterns of nasal structures in the face of the nasal breathing obstruction. Computed tomography is valuable in defining the exact anatomical extent of the disease and also in preoperative evaluation of the patient.

1. Introduction

Choanal atresia (CA), a rare congenital disorder, results from the developmental failure of the posterior nasal cavity to communicate with the nasopharynx. The incidence is approximately 1 in

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5000—8000 live births [1]. In case of bilaterality, CA can be a life-threatening emergency in the newborn or older infant and requires prompt recognition and treatment. However, most of the atresias are unilateral (60%), right sided [2]. Atretic plate can be bony or membranous, or as in most of the cases, mixed [3]. Although the diagnosis of choanal atresia is usually made by the inability to cannulate the nose with a small caliber catheter, CT is usually required for confirmation of the diagnosis. The value of CT to the surgeon, lies not only in confirming the diagnosis, but also in clearly defining the anatomy in preparation for surgical correction.

The link between the craniofacial growth and airway function has been a subject of controversy for many years. It is often claimed that normal craniofacial growth depended on physiological nasal breathing [4]. The craniofacial malformations of CA patients have been studied previously by computed tomography (CT) scan measurements. In general, there seems an agreement on some major characteristics in choanal atresia: thickening of the vomer, bowing of the lateral wall of the nasal cavity, and fusion of bony elements in the choanal region [5,6]. In this study, we made a more complete analysis of the nasal region including its anterior and posterior aspects based on CT findings and compared them with normal controls of similar age and sex ratio. Up to our knowledge, there is scanty of publication related to bilateral choanal atresia (BCA). In one study, authors have specifically defined craniofacial skeletal characteristics of infants with bilateral choanal atresia and compared them with an age-matched normative population derived from another study [7]. Our study differs from the aforementioned one that our control group has a substantially larger number of subjects. We also included some measurements other than defined by previous studies done on patients with nasal obstruction and, on normal neonate and young infants in order to enhance our understanding the nature of the disease [8,9].

2. Materials and methods

This study was carried out at Baskent University, Otorhinolaryngology and Radiology Departments. Bilateral CA patients encountered between 1997 and 2005 were included in the study. Axial computed tomography scans of 9 patients (7 girls and 2 boys; mean age 100.00 ± 109.53 days) with bilateral choanal atresia, ranging in age from newborn to 1 year were reviewed to assess the 17 different dimensions of the nasal fossa and nasopharynx. Age and sex distribution of choanal atresia patients were demonstrated in Table 1. None of the cases had associated congenital anomalies.

Table 1 Choanal atresia patients.

Case no.	Age (days)	Gender
1	4	Female
2	61	Female
3	180	Female
4	5	Female
5	63	Female
6	58	Female
7	134	Male
8	45	Female
9	350	Male

Fourteen variables were identified according to the studies previously described which we believe were clinically useful [5,8—10]. In addition, we also calculated the section area of vomer, and measured nasopharynx in horizontal and vertical planes at the same level at which nasal fossa measurements were taken. For purposes of standardization, two slices from each patient taken parallel to the orbitomeatal line were used to obtain data. The first slice at the level of nasal fossa floor showing the choanal airspace level was chosen for analysis (Figs. 1 and 2). The second slice was obtained at the level of mid-orbital region (Fig. 3). A total of 17 measurements were described in Table 2. All measurements were performed directly on the CT films that were converted to digital images by a SLR digital camera (Nikon D200,

Fig. 1 Measurements of section area of vomer (shaded area, a), anterior bony width (b), anterior mucosal width (c), minimum soft tissue width at the middle third (d), length of septum (e), and bony choanal aperture width (f).