

# A morphometric consideration of nasal septal deviations by people with paranasal complaints; a computed tomography study\*

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## SUMMARY

*The purpose of our study was to examine the localizations and the value of septal deviation by examining the coronal computed tomography of 143 persons with paranasal complaints which 72 of them were female and 71 of them were male, without taking into consideration if a deviation existed or not. The localization of the deviations of the septum nasi was investigated and the relationship between the genders were compared. The septum nasi was examined in the anterior, media, posterior regions for the left and the right directions in each person and was also examined at the superior, media and inferior levels except for the caudal end area. The value and the direction of the deviation was established. A deviation was found in one region in at least 76.2% of the 143 persons (70% female and 81% male). The maximum average deviations were found to be  $1.43 \pm 2.1$  mm in mediomedia "MM" (the vertically and sagittally middle region of the septum nasi) region with a percentage of 34.7% towards the right-hand side in the female group, and  $1.0 \pm 1.7$  mm in the MM region with a percentage of 31.9% also towards the right-hand side in the male group. The maximum deviation in the female group was found to be 7.8 mm in the MM region and 7.9 mm in the AT region in the male group. No statistically significant difference was found for the averages of the deviations ( $0.298 \pm 0.345$  mm in the female group and  $0.295 \pm 0.269$  mm in the male group) in different regions ( $p > 0.05$ ). No statistically significant difference was found for the averages of the deviations towards the right-hand and left-hand sides between the male (right  $0.302 \pm 0.292$  mm; left  $0.287 \pm 0.261$  mm) and the female (right  $0.350 \pm 0.438$  mm; left  $0.247 \pm 0.235$  mm) group ( $p > 0.05$ ). Separation of the nasal septum into 10 segments will constitute a new basically aspect for an objective, simple and practical consideration and classification.*

*Key words: septal deviation, CT, septum nasi, sinus surgery, cavum nasi*

## INTRODUCTION

Septum nasi, which consists of cartilagenous and osseous tissues, separates the nasal cavity into two halves. The nasal septum also supports the external nasal osseocartilagenous structures that are located on it. It has been suggested that the nasal septum is usually a midline structure until the age of 7 and it deviates mostly to the right side thereafter (Moore, 1994). While some authors consider the nasal septum as a figure representing the displacement of maxilla during growth and development, this suggestion has not been confirmed (Enlow, 1992). Deviation of the septum may take the form of a "C" or "S" or may look like a large spur (Donald, 1994). Cottle classified the deviations of the septum into four different groups: sublaxation, large spurs, caudal deflection and tension septum (Cottle, 1958). On the other hand, Guyuron's classification

proposes 6 different forms: tilt, anteroposterior C, cephalocaudal C, anteroposterior S, cephalocaudal S and wide spurs (Guyuron et al., 1999). These deviations may result in one-sided obstruction (Gray's, 1973), can affect the resonance of vocalization and may cause respiratory and aesthetic problems. Surgical correction may be needed in order to alleviate these conditions. Nasal septum deviations also bear importance with respect to endoscopic sinus surgery and septal plasty operations. Particularly, a deviated septum may hamper the accessibility to the region where the opening of the maxillary sinus is located during such interventions. Besides this, an increased incidence and severity of bilateral chronic sinus disease was present with increasing deviations of the septum ( $p < 0.05$ ) (Elahi et al., 1997). Deviations represent the most frequent pathological condition in the nasal septum and submucosal

resection is the most frequently applied modality for the treatment of septal deviations (Guyuron et al., 1999). Detailed knowledge about the anatomy of the deviation guides the surgeon during operations and lack of it may result in treatment failure. Thus, we decided to study and compare the localization, the direction and the degree of septal deviations in two groups of CT views consisting of male and female participants.

#### MATERIALS AND METHODS

A total of 143 coronal paranasal CT images from 143 patients (irrespective of a diagnosis of "septal deviation") were collected and studied. The mean age was 37.6 year; 72 of the subjects were female (age range: 14-82) and 71 were male (age range: 14-76). All CT images were obtained by "Philips Tomascan Tx Computed Tomography", images were 3-mm thick. In order to examine the nasal septum, the region was separated into 10 putative sections by the exploiting coronal and horizontal planes (Figure 1). The grade of deviations in 9 different segments were measured in millimeters and the direction and the localizations of the deviations were recorded (Figure 2). Because we couldn't see all the caudal end area on our CT's, we couldn't consider this area morphometrically. In order to measure the degree of deviation, a line was drawn between the upper and lower starting points of the nasal septum and the horizontal distance between this line and the most prominent point of the deviation was determined (Figure 3). Measurements were performed by the use of "Vernier Caliper" (with an error of  $\pm 0.05$  mm). The dimensions on the CT views were converted into actual dimensions by the use of direct correlation. Statistical analyses were performed by Stat View 4.0 (1992, Abacus Concepts Inc, CA, USA). The highest degree of deviation for male and female patients and the mean values for deviations were compared using analysis of variance (ANOVA). The statistical significance of these data were determined by Fisher's Posthoc Test.

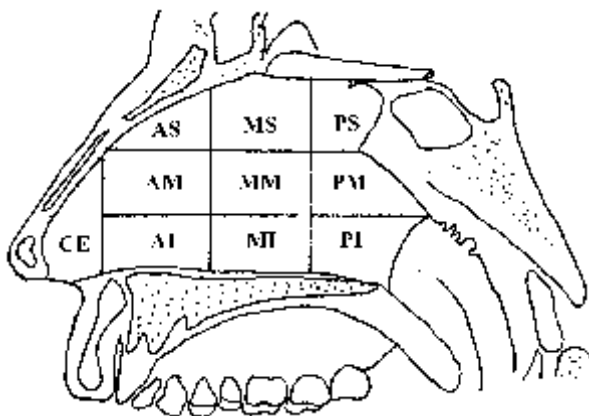


Figure 1. The 10 segments of the nasal septum obtained by the use of coronal and horizontal planes are as follows: anterosuperior (AS), anteriomedia (AM), anteroinferior (AI), mediosuperior (MS), mediomedia (MM), medioinferior (MI), posterosuperior (PS), posteromedia (PM) and posteroinferior (PI), caudal end of the septum nasi (CE).

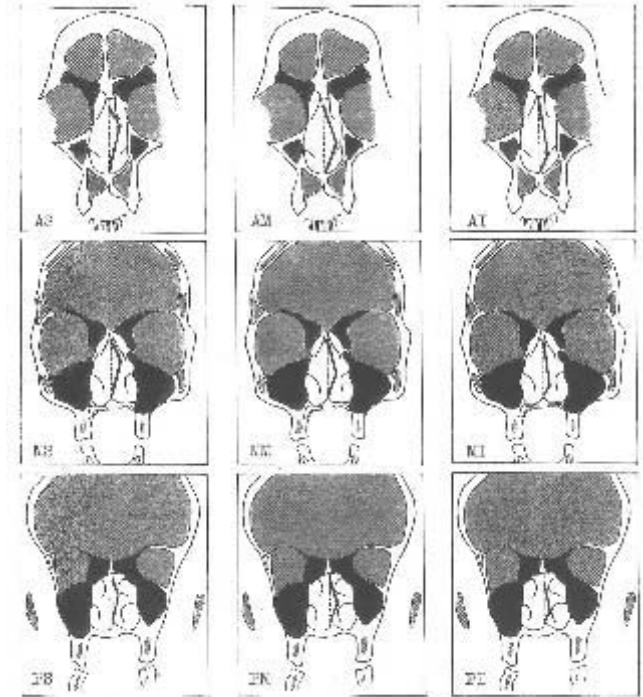


Figure 2. The nasal septum is illustrated as the intersections of three anteroposterior and three superoinferior segments. Nine different localization of the septal deviation, from superior to inferior at the anterior, media and posterior frontal sections of the septum.

#### RESULTS

Nine measurements were performed on each side of each nose. Thus, a group of total 18 measurements were considered on each subject. In both men and women, the most frequent location (34.7% in women and 31.9% in men) of deviation was the MM (mediomedia) segment of the nasal septum toward right side; the degree of deviation was  $1.43 \pm 3.1$  mm in women and  $1.0 \pm 1.7$  mm in men. The maximum amounts of deviation observed in male and female patients were 7.9 mm ( $n = 1$ ) and 7.8 mm ( $n = 1$ ) respectively; the maximum deviation in the female patient was observed in the MM (mediomedia) segment

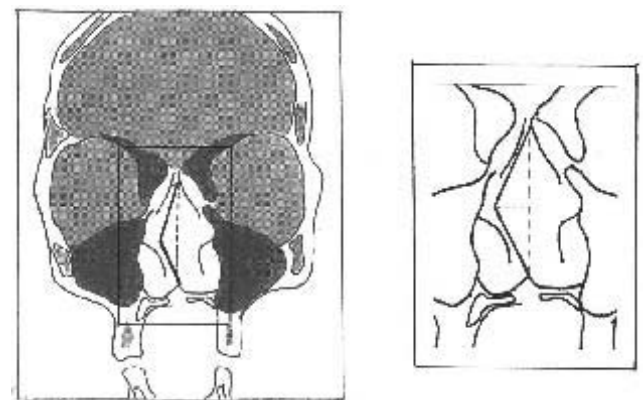


Figure 3. The horizontal distances, between the most prominent point on the septal deviation and the line between the upper and lower starting points of the nasal septum are measured.

whereas the maximum deviation in the male patient was in the AI (anteroinferior) segment (Figure 4). No deviations to the left were observed in the MS (mediosuperior) segment. The localization and frequency of deviations in men and women are illustrated in Table 1. After the data concerning the groups and locations were collected, a statistical comparison between men and women was performed. Both between-group and within-group comparisons were made regarding the degree of difference between “right” and “left” deviations (Table 2). No significant difference was detected between men and women in this respect ( $p > 0.05$ ). Also, in both sexes, no significant differences were observed between the degree of right and left deviations (for both groups:  $p > 0.05$ ).

Table 1. The frequency and the mean degree of deviations to both sides in 9 different locations in women and men. Septal deviations were most frequently observed in the MM segment in both sexes (34.7% and 31.9% in women and men respectively). No deviations to the right were observed in the MS (mediosuperior) segment in both sexes.

Location	Women Group Right %	Women Group Left %	Men Group Right %	Men Group Left %	Mean value %
AS	9.7	5.5	9.7	5.6	7.6
AM	11.1	12.5	8.3	12.5	11.1
AI	4.1	2.7	6.9	9.7	5.8
MS	0	2.7	0	1.3	2.0
MM	34.7	16.6	31.9	19.7	25.7
MI	2.7	4.1	4.2	4.2	3.8
PS	4.1	4.1	6.9	1.3	4.1
PM	13.8	5.5	12.5	11.4	10.8
PI	1.3	1.3	2.7	2.7	2.0

DISCUSSION

Although several classifications have been proposed for nasal septum deviations by different investigators, the importance of a simple classification system based on the location and direction of the deviation has been emphasized (Sciuto, 1999). The most

Table 2. Mean values and standard deviations for each location and direction in men and women were calculated. The greatest degree of deviation both in women and men was observed in the MM segment (1.0 and 1.43 mm respectively).

Location	Women Right (mm)	SD: Standart Deviation	Women Left (mm)	SD: Standart Deviation	Men Right (mm)	SD: Standart Deviation	Men Left (mm)	SD: Standart Deviation
AS	0.37	±1.2	0.22	±0.9	0.41	±1.3	0.19	±0.8
AM	0.44	±1.3	0.44	±1.2	0.29	±1.0	0.38	±1.1
AI	0.16	±0.8	0.09	±0.5	0.26	±1.0	0.39	±1.3
MS	0.0	±0.0	0.15	±1.0	0.0	±0.0	0.03	±0.2
MM	1.43	±2.1	0.80	±1.9	1.0	±1.7	0.86	±1.9
MP	0.12	±0.7	0.14	±0.7	0.12	±0.6	0.10	±0.5
PS	0.11	±0.5	0.14	±0.7	0.26	±1.2	0.07	±0.6
PM	0.45	±1.2	0.19	±0.9	0.33	±0.9	0.42	±1.3
PI	0.07	±0.6	0.05	±0.4	0.06	±0.3	0.14	±0.8



Figure 4. The AI (anteroinferior) deviation is extending to the inferior nasal concha. Deviation is located in the lower and anterior third of the septum.

important aspect of nasal septal deviations is the location of the deviation. As has been underlined by several authors, limited knowledge about the localization can result in surgical failures.

In this study, the highest incidence of septal deviation was observed in the mediomedial portion (the middle segment both anteroposteriorly and superoinferiorly) (Figure 5) of the septum in both men and women (31.9% and 34.7% respectively) and being toward the right side. This was followed by deviations toward the left side in the same location in both men and women (19.7% and 16.6% respectively). The third most common occurrence was in the AM (anteriomedia) portion (12.5% in each) with a deviation toward the left. These results suggest that septal deviations in the nose tend to occur in the middle portion of the nasal septum superoinferiorly. There were no significant differences between men and women with regard to the degree of deviations ( $p > 0.05$ ). Also, in men and women, there were no significant differences with regard to the direction (left or right)



Figure 5. A MM (mediomedial) deviation. The most prominent point of this deviation which is located in the middle antero-posteriorly and supero-inferiorly is directed toward the hiatus maxillaris.

of the deviation ( $p > 0.05$ ). Other studies demonstrated that men and women were not significantly different with respect to variations in the nasal cavity and in the osseous structures of the paranasal sinuses (Kayalioglu, 2000). Moore (1994) proposed that the nasal septum deviates to the right side most often. However, in this study, the observed difference between the frequencies of left and right deviations were not statistically significant. Guyuron classified the deviations of the nasal septum into 6 groups to assist in septoplasty procedures. But septoplasty is not the mere procedure in this anatomic location. Particularly for the functional endoscopic sinus operations (Perez-Pinas et al., 2000), a classification system incorporating the most prominent point of



Figure 6. A PS (posteriosuperior) deviation is seen. Deviation is located in the upper and posterior third of the septum.

deflection seems to be a more practical approach. It is obvious that separation of the nasal septum into 10 segments by the use of anterior (A), media (M) and posterior (P) zones anteroposteriorly, superior (S), media (M) and inferior (I) zones superoinferiorly and the caudal end area (CE) will constitute the basis for an objective and simple classification. In view of that, it should be remembered that the terms “high septal deviation” (by our classification: superior deviations) (Figure 6), and “anterio-caudal deflection” (by our classification: antero-inferior deviations), have been utilised by Yanagisawa (2001) and Francesconi (1973) respectively. This demonstrates that the classification system used herein is therefore a practical one.

In this study the localisation, degree and the direction of septal deviations in men and women were compared. To our knowledge, this is the first study to define a “10-compartment” model for the localization of the deviations of the nasal septum. Because of its importance in clinical examinations we included the caudal end of the septum nasi into the classification, but because the caudal end area couldn't be seen completely in our CT's, we couldn't make any morphometrical investigation about the caudal end in this study.

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