ORIGINAL STUDY

Is there any relationship between septal deformities and chronic rhinosinusitis?

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ABSTRACT

BACKGROUND. Nasal septal deformity is one of the most common disorders in human beings. These deformities may cause and aggravate sinusitis, upper airway infection. The question arises here whether or not some of septal deformities are involved more frequently in this process or not. To elucidate this, we need a practical classification of septal deformities, which will perfectly serve to make recordings standardized, reliable and comparable.
OBJECTIVE. The purpose of the study was to determine the role of septal deviation in the pathogenesis of chronic rhinosinusitis (CRS).
MATERIAL AND METHODS. This retrospective clinical study was performed on 262 patients split in two groups: 154 patients suffering from CRS according to EPOS criteria and 108 healthy volunteers with no clinical signs of CRS. Patients with septal deformities were assessed by native anterior rhinoscopy, anterior rhinoscopy after decongestion, fiber endoscopy and CT-scans in axial and coronal projections. Mladina's classification of septal deformities was used for the records of septal findings.
RESULTS. In our study, the most frequent types of septal deviations were Passali deformity (30%), type 5 (22%) and type 3 (18%), with no difference between males and females regarding the different types of septal deviation. Passali deformity and type 2 of septal deformities are less risky (positive values: 0.68 and 0.35) in comparison to the rest of the types, regarding CRS occurrence.
CONCLUSION. Our study establishes that type 3 is the most risky in comparison to the rest of the types for CRS occurrence, relative to our volume of sample and under hypothesis of representativeness. Further studies need to be performed in order to determine the role of osseous parts in the pathogenesis of chronic rhinosinusitis, for a better surgical and medical approach.
KEYWORDS: septal deviation, chronic rhinosinusitis, fiberendoscopy.

INTRODUCTION

Nasal septal deformity is one of the most common disorders in human beings and it is manifested by symptoms such as nasal obstruction and postnasal discharge.

Everyday experience teaches us that septal deformities are very frequent in patients suffering from chronic rhinosinusitis (CRS). Septal deformities may cause and aggravate sinusitis, upper airway infection and various middle ear infections.

The question arises here whether or not some of septal deformities are involved more frequently in this process or not.

To elucidate this, we need some clear system; for instance, a practical and user-friendly classification of septal deformities will perfectly serve to make recordings standardized, reliable and comparable.

One should take into consideration the fact that not all septal deformities can be easily recognized during the simple anterior rhinoscopy, but only after the decongestion of the nasal mucosa, or by means of fiberendoscopy of the nose under local, superficial anesthesia.

The stuffed nose has an adverse effect on the development of the child. Also, it has been reported that nasal septal deformity has an important effect on the facial growth and development, especially in the first decade of life[1-3].

Numerous epidemiological studies on the frequency of nasal septal deviation in humans (from newborn period to adulthood) have been performed over the last decades. These studies were conducted on different age groups and used various classifications. They showed rather variable prevalence rates, ranging from 0.93% in India to 55% in Greece[4,5].

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The aim of this work is to examine the role of septal deviation in adults in the pathogenesis of chronic sinusitis. This evaluation would allow a better understanding of the contributing factors to this pathology and would improve results in their management.

Our study was performed on a sample consisting in Romanian patients. Part of this sample was used in the "International Study of the Incidence of Particular Types of Septal Deformities in CRS Patients – The Outcomes from 5 Countries" (Turkey, Italy, Russia, Croatia and Romania) which will be soon published in an high-rank international journal.

Types 3, 5 and 7 have been found to be the most frequent among CRS patients in these countries; since type 7 is in fact a combination of one of the horizontal (types 5 or/and 6) and one of the vertical deformities (types 1-4), it really is the most important and the most difficult deformity for the surgical treatment. According to these recent works (the 5 countries studies) and due to the fact that in the Italian group they encountered an increased number of such deformity (type 7), all the authors agreed that this type should be called Passali deformity.

MATERIAL AND METHODS

This retrospective clinical study was performed on 262 patients split in two groups: 154 patients suffering from CRS according to EPOS criteria (Figure 1) and 108 healthy volunteers with no clinical signs of CRS. Patients with septal deformities were assessed by native anterior rhinoscopy, anterior rhinoscopy after decongestion and **fiberendoscopy**, the most relevant examination.

Pathological septal deformities were recorded, according to the Mladina's classification, into seven types:

- Type 1: Vertical anterior deflection of the septum, in close contact with the limen nasi (i.e., a part of the anterior nasal valve).
- Type 2: Vertical anterior deflection of the septum, in much closer contact with the limen nasi (i.e., a part of the anterior nasal valve).
- Type 3: Vertical, more posteriorly located deflection of the septum, near the head of the middle turbinate.
- Type 4: S- or Z-shaped septum (i.e., type 2 on one side and type 3 on the other side).
- Type 5: Unilateral and horizontal, with a slightly ascending spur. The other side of the septum is almost flat in most of the cases.
- Type 6: A characteristic deep anterior groove between the septum and the wing of the inter-maxillary bone on one side, and an anterior basal crest at the corresponding level of the septum.
- Type 7 (Passali deformity): a combination of the previous six types of deformities. It usually involves a combination of some of the vertical deformities (types 1-4) and horizontal deformities (types 5 and /or 6).

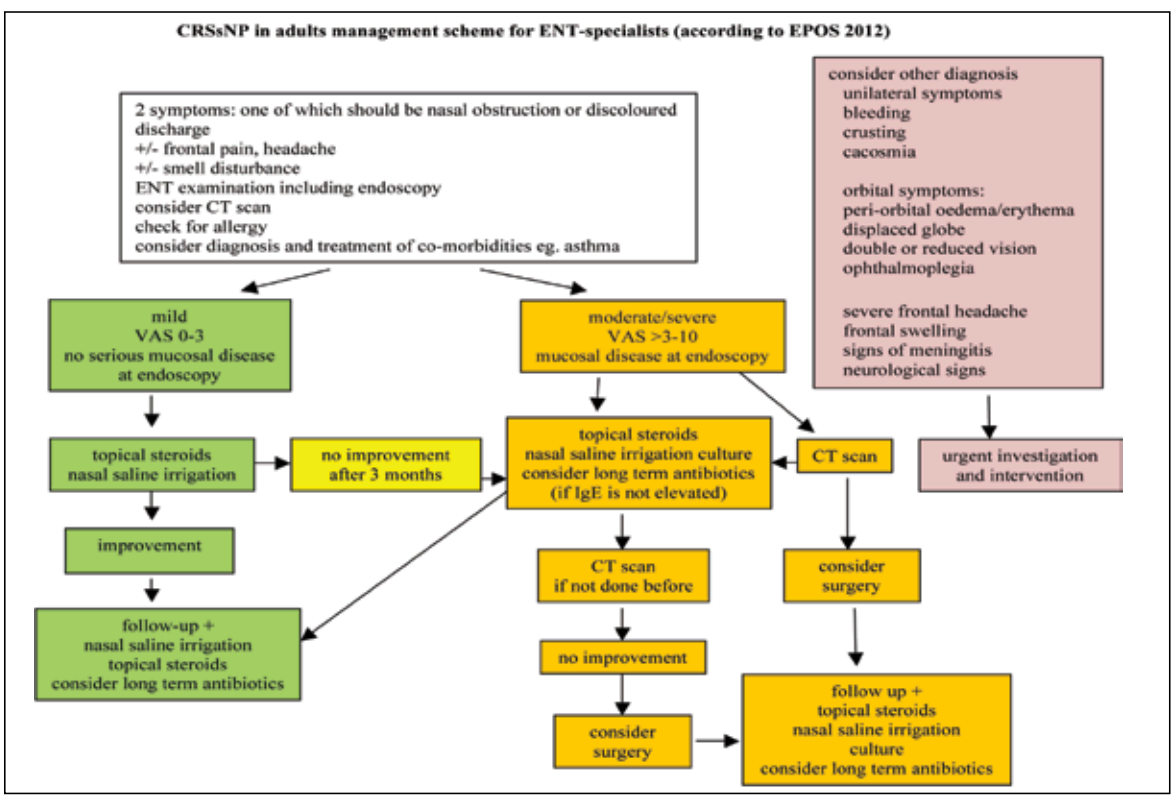

Figure 1 EPOS criteria on Chronic Rhinosinusitis

Inclusion criteria:
- CRS patients (EPOS criteria)
- Older than 18 years
- Patients with septal deformities (assessed by native anterior rhinoscopy first, than anterior rhinoscopy after the decongestion and, finally, by means of fiberendoscopy under local superficial anesthesia)
- CT-scans in both axial and coronal projections
- Patient's inform consent

Exclusion criteria:
- Previously operated patients
- Pregnancy

Since the entire first group, CRS patients, had the CT-scans in both axial and coronal projections, this was also an unique and great opportunity to investigate in parallel the correspondence between septal deformity and its appearance on CT scans. We already know very well from our praxis that "vertical" septal deformities like type 1, 2, 3 and 4 can be very easily seen on axial scans (which is logical from the physical point of view), and types 5 and 6 can be perfectly identified on the coronal ones.

RESULTS

Supposing that type of septum deviation is a driver variable for probability of event occurrence, we will start with assessment of its predictive power, concluding for exclusion / inclusion into a given predictive model (probability of rhinosinusitis occurrence).

SAS software was used for statistical analysis of data, using measures as Kolmogorov-Smirnov test, weight of evidence and information value.

The CRS group (59%) consisted of 154 subjects, including 83 males and 71 females (54% and 46%, respectively). Their mean age was 48 years, ranging from 18 to 83 years. The non CRS group (41%) consisted of 108 subjects, including 61 males and 47 females (56% and 44%, respectively). Their mean age was 40 years, ranging from 18 to 61 years (Figure 2).

We observed that Passali deformity and type 5 have higher weights in the non-CRS group (46%, respectively 16%), while in the CRS group, each of Passali deformity, type 5 and type 3 are in proportions of 23% (Figure 3).

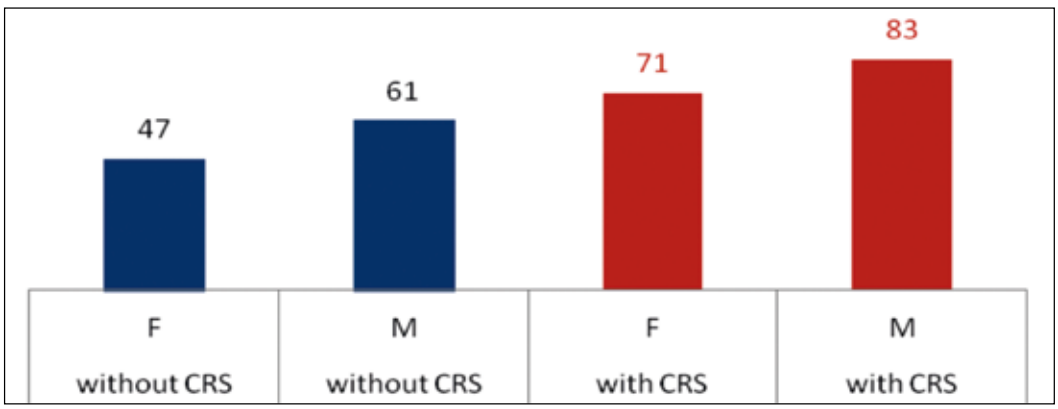

Figure 2 Sample distributions by gender

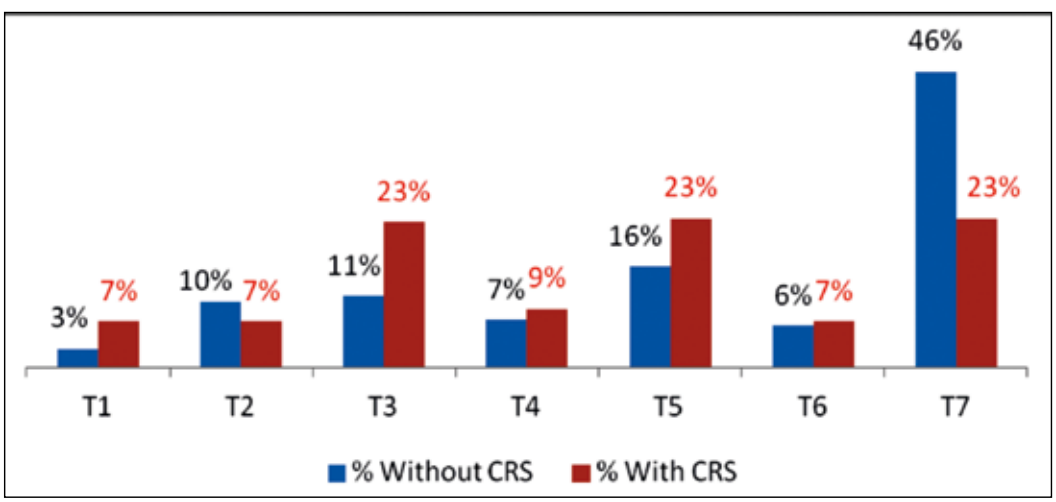

Figure 3 Sample distributions by septal deformities type

Figure 4 shows cumulative percentage of types of septal deviation related in CRS and non-CRS samples. The two-sample Kolmogorov-Smirnov test is one of the most useful and general nonparametric methods for comparing two samples. Maximum absolute distance between the two curves (non-CRS and CRS) is 0.23. The null distribution of this statistic is calculated under the null hypothesis that the samples are drawn from the same distribution. The null hypothesis is rejected at level 5% (p-value<0.05), hence there is a significant difference between the two distributions of patients by types of septal deviation.

Also, the Kolmogorov-Smirnov test shows that there is no significant difference between the distributions of genders by types of septal deviation (p-value>0.05). Maximum absolute distance between the two distributions is 0.1 (Figure 5).

The Weight of Evidence (WoE) of an attribute is defined as the logarithm of the ratio of the proportion of "non Rhinosinusitis" in the attribute over the proportion of "Rhinosinusitis" in the attribute. High negative values correspond to high risk and high positive values correspond to low risk. The classing process determines how many points an attribute is worth relative to the other attributes of the same characteristic. For each group "i" of the characteristic "type of septum deviation" (from 1 to 7) - high prevalence of "Rhinosinusitis" corresponds to a low value for WoE per attribute.

Information Value (IV) measure is used to assess the characteristic's predictive power (its ability to separate high risks from low risks). This will aid the selection of "type of septum deviation" variable for inclusion in the predictive model (Table 1).

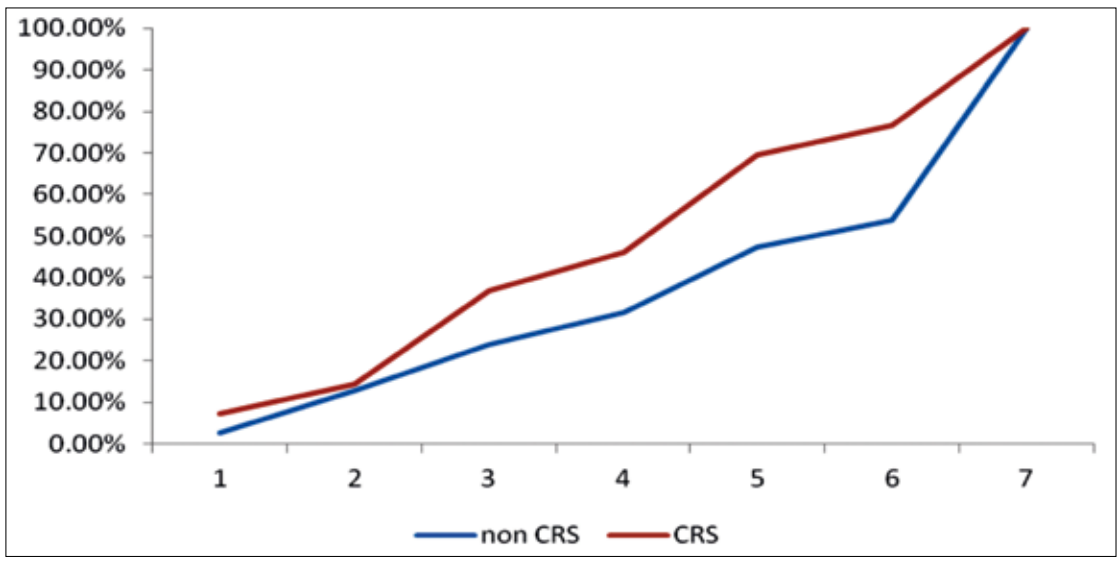

Figure 4 Sample cumulative distributions by types

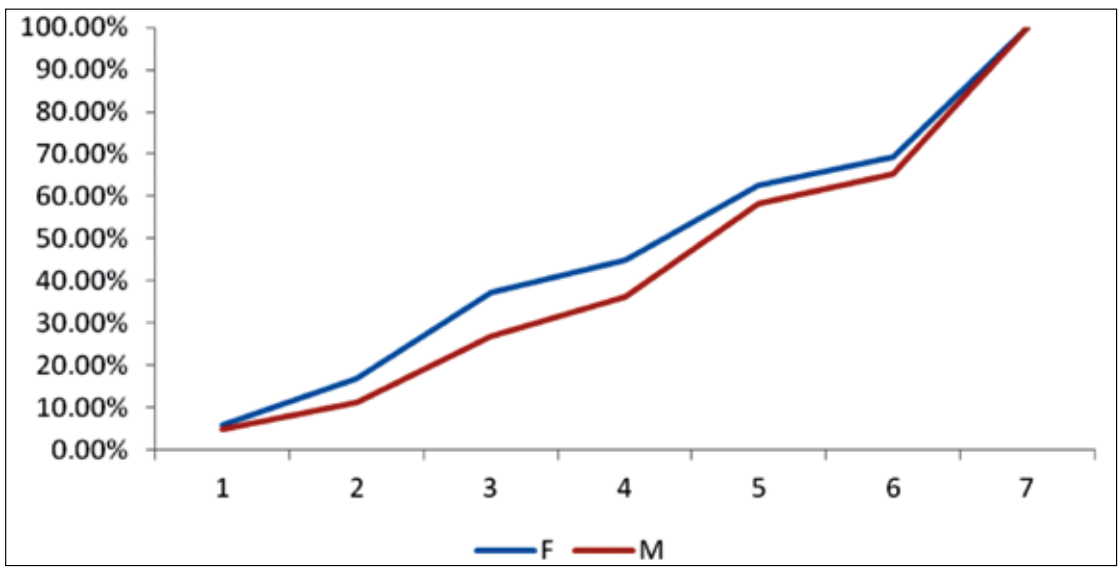

Figure 5 Gender cumulative distributions by types

Table 1
Traffic light assessment

Value of IV	Statistical strength
less than 0.02	a very weak statistical relation
0.02 - 0.1	a weak statistical relation
0.1 - 0.3	an average statistical relation
0.3 - 0.5	a strong statistical relation
greater than 0.5	an extremely strong statistical relation

In order to manage the presence of outliers, we decided to use a non parametric test of correlation, Spearman's test. It is a moderate correlation (rho=61%) between age and prevalence of CRS. Type of septum deviation and age are independent variables (rho=29%), but age assessment as driver variable for probability of CRS occurrence is not in scope of our study.

The most frequent types of deviations are Passali deformity (33%), type 5 (20%) and type 3 (18%). We observed a major prevalence of patients with CRS among the patients with type 1 of septal deviation (79%) , type 3 (74%) , type 5 (68%) , type 6 (64%), type 7 (61%) (Figure 6).

We mention here that weight of type 1 of septal deviation is not significant (low volume of data).

Weight of Evidence measure **(WoE)** shows that Passali deformity and type 2 of septal deformities are less risky (positive values: 0.68 and 0.35) in comparison to the rest of the types, regarding CRS occurrence (Figure 7).

Type 3 and 5 are the most risky among all types of septal deformities (-0.72 and -0.40), the value for type 1 being non relevant.

Since the Information Value Indicator is about 0.3, the type of septal deviation variable is in moderate statistical relation with CRS occurrence (Table 1).

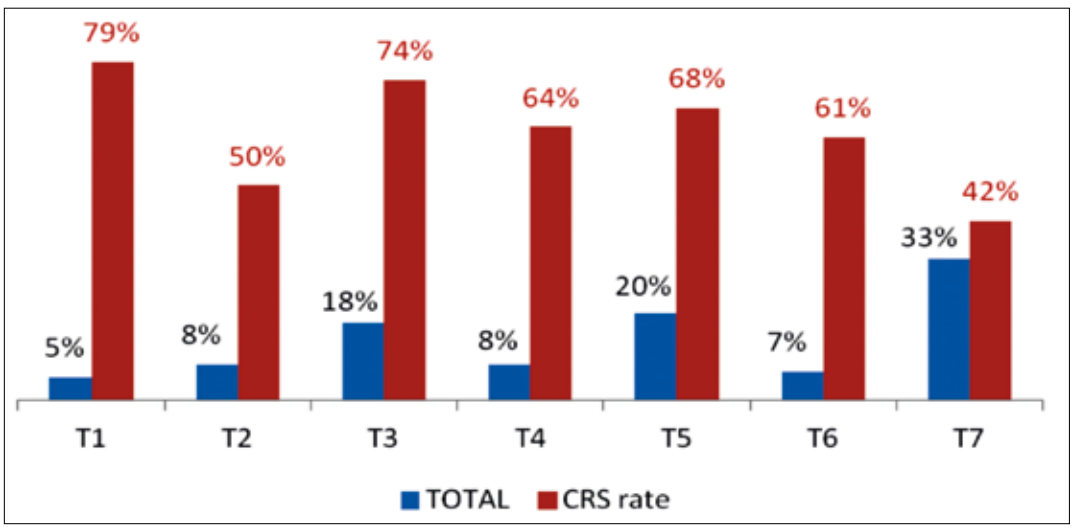

Figure 6 Prevalence of patients with CRS

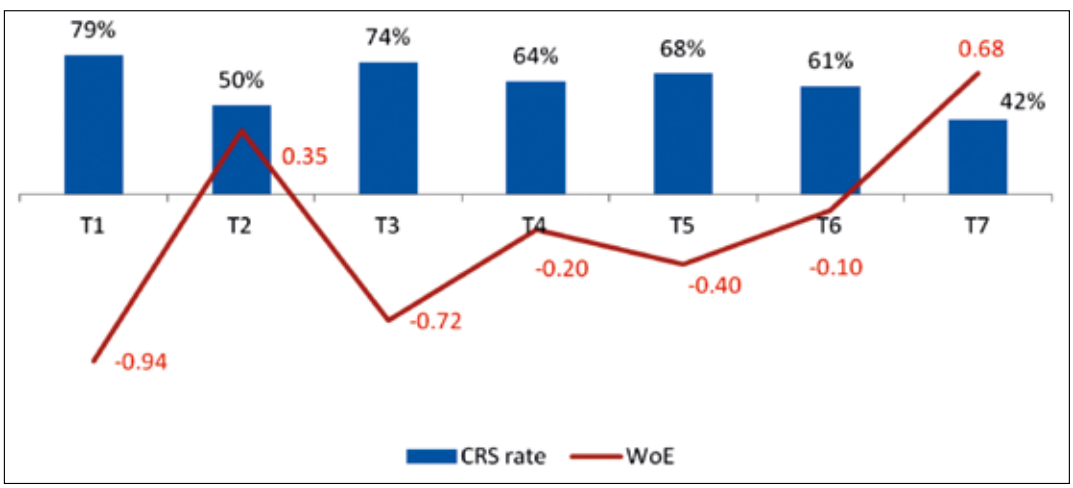

Figure 7 Types of septal deviation by riskiness

DISCUSSIONS

Septal deviations are extremely common, but are not usually severe enough to affect nasal function. In assessing the septum, the degree of deviation, as well as the site of the deviation, is important. Mladina, in 1987, suggested the classification of septal deformities into seven types. It should be mentioned that some of the types (particularly those located more posteriorly) can be discovered sometimes only by means of endoscopy of the nose, therefore our study was focused on the considerations of this investigation.

In the literature, rather variable rates on the prevalence of nasal septal deformities in different age groups have been reported. By far, several epidemiologic studies on nasal septal deviation have been conducted, in which different classification systems have been used[4,6-10]. In our study, a weak correlation has been reported between the variables "age" and "type of septum deviation" (Spearman rho = 29%).

Subric and Mladina's study, using Mladina's classification system, demonstrated that the prevalence of deviations of the anterior (cartilaginous; type 1, 2 and 6) and posterior (osseous; types 3, 4 and 5) parts of the septum was 83.7 and 15.7% respectively[6]. Type 1 deformities were the most frequent, followed by type 2 deformities, whereas Passali deformity was the least frequent.

In "International Study of the Incidence of Particular Types of Septal Deformities in CRS Patients: the Outcomes from 5 Countries", it is demonstrated that types 3, 5 and the Passali nasal septal deformity (type 7) were the most frequent deformities among the CRS patients in the countries involved in the previously mentioned study and also in our study.

Ilhami Yildirm (2003), in Turkey, found that anterior deformities (type 1 and 2) were the most commonly encountered types in the pre-school children, but the occurrences of posterior deformities (type 3,4 and 5) were relatively increased as the age increased[11].

A study of presenting complaints showed that nasal obstruction was the most frequent 85%, followed by headache 50%, post nasal drip 28% and throat discomfort 22%.

In most studies, prevalence of septal deviation looks the same when being compared among patients with radiological rhinosinusitis and among the general population. Stammberger[9,12] suggests a pathophysiological role of the septum through a mechanical obstruction on the ostiomeatal complex.

In our study, Passali deformity and type 2 of septal deformities are less risky (positive values: 0.68 and 0.35) in comparison to the rest of types, regarding CRS occurrence. Type 3 and 5 are the most risky among all types of septal deformities.

CONCLUSIONS

Our study establishes that type 3 is the most risky in comparison to the rest of types for CRS occurrence, relative to our volume of sample and under hypothesis of representativeness.

Further studies need to be performed in order to determine the role of osseous parts in the pathogenesis of chronic rhinosinusitis, for a better surgical and medical approach.

We conclude that, in planning the surgical treatment of CRS patients, our attention should not be focused exclusively on endoscopic sinus surgery, but should also focus on the morphology of the nasal septum.

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