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Anatomical variants, clinical presentation and pathological findings in patients suffering from chronic rhinosinusitis underwent functional endoscopic sinus surgery

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In this study, we investigated the different anatomical variations and clinical modes of presentation of chronic rhinosinusitis and their association with final histopathological diagnosis. This prospective randomization research was conducted on a total of 284 patients with chronic rhinosinusitis who underwent functional endoscopic sinus surgery from March, 2009 to September, 2012. The study population (284 patients) included 170 males (59.8%) and 114 females (40.1%), with a mean age of 29 years. The most frequent symptoms were nasal obstruction (24.3%); headache (21.9%), nasal congestion (18.5%) and post nasal discharge (16.6%). The nasal septums were significantly deviated in 207 (79.2%) subjects. Inferior turbinate hypertrophy was observed in 102 (35.9%) patients. Bulla ethmoidalis was reported in 32 (11.3%) participants. Uncinate bulla and concha bullosa were identified in 12 (4.2%), 12 (4.2%) patients, respectively. According to pathological report, majority of the patients (184 patients, 64.7%) had chronic inflammation in sinuses went after polyp in 46 patients (16.9%). Our study revealed anatomical variations were common in patients with chronic rhinosinusitis. Identification of different variations will guide the surgeons during functional endoscopic sinus surgery.

Key words: Chronic rhinosinusitis, functional endoscopic sinus surgery, anatomical variations.

INTRODUCTION

Based on the National Health Interview Survey of 1996, chronic rhinosinusitis (CRS) was the second chronic disease in USA imposing 12.5% of the US population or nearly 31 million subjects annually (Adams et al., 1999; Anand 2004). In this regard, according to 2008 National Health Interview Survey information, rhinosinusitis imposed 1 in 7 adults (Pleis et al., 2009). Since CRS was established on symptomatic criteria, this prevalence was

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probably overestimated in these studies. Due to coexisting inflammation of the nasal and sinus mucosa, the present terminology is ‘‘rhinosinusitis.’’; if the clinical symptoms of this inflammation exist for at least 12 weeks with no complete resolution, we call it chronic (Koen et al., 2011; Hashemi et al., 2012).

The introduction of functional endoscopic sinus surgery (FESS) besides the medical therapy for CRS, made the interventional procedures competent (Kennedy 1985; Stammberger 1985). Short- and long-term investigations worked on FESS results, elucidated development in sinus symptoms and reduced recurrent infections (Kennedy 1992; Senior and Kennedy 1998). Endoscopic sinus surgery has been established as a safe method and complications prevalence is indicated to be less than 1% (Chiu and Kennedy 2004). Numbers of complications include blindness, intracranial injury, orbital hematoma, stroke and cerebrospinal fluid leak (Luong and Bradley, 2006). In this relation, there are pathologic situations which need a more aggressive FESS. For instance, extensive nasal polyposis affecting middle turbinate required to be removed partially since post surgery reduced prevalence of synechiae, long-term patency of middle meatus antrostomy, developed nasal airflow, reduced nasal resistance and developed intrasurgery and postsurgery access to the ethmoidal labyrinth (LaMear 1992; Lawson 1994; Cook et al., 1995; Stewart 1998; Giacchi et al., 2000).

In this study, we attempted to explore the different anatomical variations and clinical modes of presentation of CRS and their relation with final histopathological diagnosis and to clarify these conditions from other situations in patients who underwent FESS.

METHODOLOGY

This prospective study population involved 284 subjects including 170 male and 114 female subjects, aged 5 to 70 years, who underwent FESS for CRS from March, 2009 to September, 2012. The ethics committee of Mazandaran University of Medical sciences (Sari IRAN) approved this study. Written informed consent was obtained from all participants prior to initiation of investigation.

Inclusion and exclusion criteria

All patients were selected according to criteria for CRS as described by (Benninger et al., 2003). Our exclusion criteria involved age younger than 5 years, history of coronary artery disease and bleeding disorders. Subsequent checkups were performed before surgery and in each visit, patients were questioned regarding nasal obstruction, headache, nasal congestion, post nasal discharge, breathing disorders, cough, facial pain, hoarseness, epistaxis and anatomical variation were examined during FESS.

Randomization

852 patients considered for the research were randomized before the study. Assignment to groups was carried out by computer-generated random numbers. The randomization process was done by a third party; all of the patients and doctors were excluded in selection section.

Statistical analysis

Descriptive analysis was performed to characterize the outcomes including demographic, anatomical variants, histological reports, clinical symptoms and any other information before and during checkups and FESS. Data were transferred to MS-excel spread sheets. The procedures involved were transcription, preliminary data inspection, content analysis and at last interpretation. Investigators used percentages (SPSS software, Version 15, Chicago, IL, USA) to interpret epidemiological variables.

RESULTS

The study group (284 patients) included 170 males (59.8%) and 114 females (40.1%), with a mean age of 29 years. The most frequent symptoms among these patients were nasal obstruction (24.3%), headache (21.9%), nasal congestion (18.5%) and post nasal discharge (16.6%) (Table 5). The nasal septums were significantly deviated in 207 (79.2%) subjects (Table 4). Inferior turbinate hypertrophy was observed in 102 (35.9%) patients (Table 4). Bulla ethmoidalis was reported in 32 (11.3%) participants (Table 4). Uncinate bulla and concha bullosa were identified in 12 (4.2%) and 12 (4.2%) patients, respectively (Table 4). Most of the patients were in the range of 10 to 20 years (83 patients, 29.4%) followed by 20 to 30 (73 patients, 25.7%) and 30 to 40 years (70 subjects, 24.6%) (Table 1). According to pathological report, majority of the patients (184 patients, 64.7%) had chronic inflammation in sinuses went after polyp in 46 patients (16.9%) (Table 3). Most of the patients (142 patients, 50%) had history of symptoms for 1 to 5 years. 63 patients (22.2%) indicated these symptoms for 5 to 10 years (Table 2).

DISCUSSION

This manuscript is divided into two broad sections. In the first part we discussed the anatomical variants in CRS and in the second section we talked about the clinicopathological feature of study population.

Advances in operational procedures resulted in better findings with less complications in the paranasal sinus area. Therefore in this trial, we examined the correlation of anatomical variations and presence of CRS. Functional endoscopic sinus surgery (FESS) is used for CRS refractory to medical therapy. The indications for FESS are expanding and discussion about these indications is beyond the scope of this manuscript but in this relation, some absolute indications for FESS in children are summarized (Fokkens et al., 2007):

1. Complete nasal obstruction in CF due to massive

Table 1. Age distribution of patients in this series.

Age	Number	Percent
5-10	18	6.3
10-20	83	29.4
20-30	73	25.7
30-40	70	24.6
40-50	24	8.4
50-60	6	2.1
>60	10	3.5

Table 2. Individual differences in duration of chronic rhinosinusitis before functional endoscopic sinus surgery.

Duration (year)	Number	Percent
<1	50	17.6
1-5	142	50
5-10	63	22.2
>10	29	10.2

Table 3. Classification of pathological reports.

Pathology	Number	Percent
Chronic inflammation	184	64.7
Polyp	46	16.9
Allergic rhinosinusitis	27	9.5
Squamous cell carcinoma	8	2.81
Hemangioma	8	2.81
Craniophryngioma	6	2.1
Rhinolith	5	1.7

Table 4. Distribution of anatomical variants in patients with chronic rhinosinusitis.

Anatomical variations	Number	Percent
Nasal septal deviation	207	79.2
Inferior turbinate hypertrophy	102	35.9
Bulla ethmoidalis	32	11.3
Concha bullosa	12	4.2
Uncinate bulla	12	4.2

polyposis or due to medialization of the lateral nasal wall;
2. Orbital abscess;
3. Intracranial complications;
4. Antrochoanal polyp;
5. Mucocoeles or mucopyocoeles;
6. Fungal rhinosinusitis.

Possible indications consist of CRS with frequent exacerbations continuing despite optimal medical therapy and after exclusion of any systemic disease (Daniel, 2011).

Table 5. Pre-operative symptoms in this study.

Pre-operative symptoms	Number	Percent
Nasal obstruction	69	24.3
Headache	63	21.9
Nasal congestion	53	18.5
Post nasal discharge	48	16.6
Breathing disorders	22	7.6
cough	11	3.6
Facial pain	8	2.9
hoarseness	6	1.8
Epistaxis	4	1.4

The presence of an air cavity inside the lamina recurvata is called concha bullosa. This space is ranging from too small to considerable in size (Meloni et al., 1992). Different studies reported various frequencies of the concha bullosa, including 17, 21 and 28% (Meloni et al., 1992; Zinreich et al., 1987; Is¸yk and Bulut 1994). It has been shown that these variants may be the cause of middle meatal obstruction and recurrent ethmoiditis (Shechtamn et al., 1993). Some studies reported a correlation between the concha bullosa and sinusitis (Shin 1986; Calhoun et al., 1991), but some investigations indicated there was no significant association (Danese et al., 1997; Lam et al., 1996). In this relation, (Calhoun et al. 1991), showed there was a probable relation between concha bullosa or septal deviation and rhinosinusitis (Calhoun et al., 1991). In consistent with previous investigations, Hamdan et al., 2011 indicated there was no significant association between septal deviation and rhinosinusitis. (Hamdan et al., 2011; Jamie et al. 2004) elucidated seventy-three percent of their study participants with concha bullosa who had paranasal sinus inflammatory diseases; but 78% of patients without concha bullosa also suffered from some forms of inflammatory diseases. (Hisham et al., 2011) reviewed that the computed tomography scans of 63 subjects underwent revision FESS. They showed 15.9% of the series had significant deviation of the nasal septum.

In our study, 12 patients (4.2%) were identified with concha bullosa and nasal septal deviations were highlighted in 207 (79.2%) of the subjects. Our exploration confirmed that nasal septal deviations are a significant interest in CRS. The previous studies did not discuss about the inferior turbinate hypertrophy, in contrast to former findings, in this series inferior turbinate hypertrophy was elucidated in 102 (35.9%) patients. Pneumatization of the uncinate process is named uncinate bulla, which may lead to anatomic narrowing of the infundibulum and could damage sinus ventilation (Bolger et al., 1990; Bolger et al., 1991, Rao and El-Noueam 1998). Although this variant is not well described but (Kennedy and Zinreich, 1988) reported one subject with uncinate bulla in a series of 230 participants. Bolger et al. (1991) studied

the CT scans of 202 patients and indicated the uncinate bulla in 2.5% of study population. Likewise in these researches, uncinate bulla were reported in 12 (4.2%) of our study population.

In 2003, a consensus panel described CRS as an inflammatory disease of the nose and paranasal sinuses of not identified etiology defined on the basis of characteristic symptoms (≥ 2 as follows: nasal congestion, facial pain/pressure, anterior or posterior nasal drainage and decreased or absent sense of smell), (duration more than12 weeks), and objective evidence of sinus disorder by means of direct visualization or imaging examination (Benninger et al., 2003). Among these 284 patients, the most frequent symptoms were nasal obstruction (24.3 %), headache (21.9%), nasal congestion (18.5%) and post nasal discharge (16.6%) (Table 5). Based on pathological report, most of the patients (184 patients, 64.7%) were identified with chronic inflammation in sinuses followed by polyp in 46 patients (16.9%) (Table 3). Allergic rhinosinusitis were reported in 27(9.5%) patients according to measurement of serum immunoglobulin (IgE) (Table 3). Although based on symptoms, all of these subjects were identified with CRS but after FESS some patients showed other diseases like (based on histological report) squamous cell carcinoma, hemangioma, craniophryngioma, rhinolith (Table 3).

Conclusion

The frequencies of anatomical variations, clinical symptoms and pathological features have been reported in various ethnics and each study indicated these numbers, and frequencies are not the same which may be the result of different genetic and environmental factors.

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Conflict of Interests

The author(s) have not declared any conflict of interests.

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