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Original Article

Conchal compression: is it a new syndrome?

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Abstract: Objectives/Hypothesis: To describe the diagnostic criteria and treatments of concha compression syndrome (CCS). Patients and methods: Patients who reported at least 3 times rhinosinusitis attacks per year were considered in this study. All patients met the diagnosis criteria of rhinosinusitis based on clinical history, showed a nasal septal spur compressing concha on their endoscopic examination and had no findings of rhinosinusitis on their paranasal sinus CT scans but showed concha ondularis. These patients were recognized as suffering from CCS and consequently were surgically treated. Results: 85 patients diagnosed with CCS were included in this study. 25 of the patients were classified as middle, 53 as inferior and 7 as both middle and inferior CCS. Septal spur removal was performed on 16 of the patients whereas the remaining 69 patients received spur removal with septoplasty. After surgery, most of patients' symptoms improved clinically. Conclusion: The importance and the necessity of further investigations into this newly-defined syndrome in the differential diagnosis of rhino-neurogenic symptoms is made clear by this study.

Keywords: Concha compression, concha ondularis, rhinosinusitis, nasal septal deviation, headache

Introduction

Diagnostic criteria of rhinosinusitis developed by American academy in 1997 are used routinely by family practice physicians and ENT clinics. Some patients are diagnosed with rhinosinusitis and treated according to these criteria. However, acute rhinosinusitis diagnosis is not supported radiological even in the acute period of these patients. Therefore, in routine clinical practice, the symptoms of these patients are tried to be accounted for by septum deviation, allergic or recurrent acute rhinosinusitis or even by headaches involving anterior aspect. However, although clinical picture of such patients meet these criteria, we believe that clinical diagnosis mentioned is not accurate for the patients. Allergy tests yield negative results in these patients, and in paranasal sinus tomography, no mucosal disease suggesting sinusitis is reported. Nevertheless, we observed pathological condition in tomography that can lead to symptoms and signs of rhinosinusitis. This condition presents as the pressure exerted by septum spur with or without deviation on lower or middle concha, leading to shape changes in them. To our opinion, this pathological change may cause rhino-neurogenic symptoms when combined with environmental and emotional factors. We named this clinical picture as concha compression syndrome (CCS) and we aimed that the clinico-radiological characteristics and treatment of CCS is presented herein.

Material and methods

This study received approval from our local institutional review committee, and all patients gave written informed consent. The present study was carried out on patient group selected from October 2005 to November 2013. Patient selection criteria were as follows:

1. Patients who were diagnosed as rhinosinusitis at least three times in a year according to symptomatic criteria defined by the rhinosinusitis work group in 1997 [(1) (**Table 1**)] and spe-

cifically, their symptoms returned in the presence of triggers (premenstrual period, emotions, environmental changes especially exposure to wind or cold air) were included in this study.

2. The patients who had nasal septum spur with compression on a nasal concha were included in the study. Their CT scans did not revealed mucosal sinus pathology, nasal polyps, and the other pathologies.

3. Patients already diagnosed with allergic rhinitis, vasomotor rhinitis, immotile cilia syndrome or immune system disorders were excluded in this study.

Patients and CT examination

A rhinosinusitis diagnosis criterion developed in 1997 by the American Academy of Otolaryngology-Head and Neck Surgery was used to identify patients with symptoms and signs (**Table 1**). In each patient, these symptoms and signs were determined. The presence of at least 1 major factor and 2 minor factors or 2 major factors was deemed sufficient for the diagnosis of rhinosinusitis [1]. We assigned a score of 2 for every major factor and 1 for every minor factor. Therefore, a total score of our diagnosis is at least 4.

CT of the paranasal sinuses was performed after the endoscopic endonasal examination during the acute period. The CTs were obtained in the axial plane, parallel to the hard palate, using thin-slice technique. Coronal reformats were then reconstructed to better evaluate the sinonasal anatomy. Patients with sinusitis, polyp and other tm etc. pathologies were excluded from the study. We referred to as *concha ondularis (CO)* a change in concha morphology caused by nasal septum spur pressure.

The patients were divided into three groups according to the localization of CO in the CT. The first group consisted of those patients with middle CCS with middle CO. The second group consisted of those with inferior CCS and inferior CO. The third group patients with inferior and middle CCS (mixed CCS) had both inferior and middle CO.

The final study group consisted of 85 patients who accepted the surgical treatment among the 223 patients with a diagnosis of concha compression syndrome between October 2005 and November 2013.

Surgical treatment and follow-up

The senior author operated all patients. Either endoscopic spur removal or classical septoplasty was performed on patients who had the compression due to nasal septal spur is accompanied with the septum deviation. If no septum deviation was present, only endoscopic spur removal was performed. Some of the removal surgeries were done under local anesthesia using the endoscopic endonasal approach. A follow-up of each patient was performed at least six month after the surgery. Symptom scoring was again calculated in the postoperative period. Preoperative and postoperative scores were compared statistically. Control CT was obtained in patients with recurring symptoms similar to preoperative ones.

Data analysis was performed by using SPSS for Windows, version 20.0. One-way ANOVA, Pearson chi-squared tests and Wilcoxon test were used.

Results

Out of 85 patients, 42 were male and 43 were female, aged between 18 and 86 with a mean of 34.6 years. Groups 1, 2 and 3 included 25, 53 and 7 patients respectively. Patient mean ages in groups 1, 2 and 3 were 35.32±10.37, 35.16±12.41 and 27.85±6.4 respectively. A one-way ANOVA test showed no statistically significant difference between the groups in terms of mean age. Likewise, based on a Pearson chi-squared test, the difference in gender distributions was not statistically significant. All patients had at least one major factor (symptom) or indicating the diagnosis of rhinosinusitis. Most commonly observed major factors in group 1 and 2 were “facial pain/pressure” and “discolored postnasal drip” respectively, whereas most commonly observed major factors in group 3 were “nasal discharge/discolored nasal drip” and “facial pain/pressure”. The distributions of major factors of all groups in the diagnosis are presented in **Table 1**. Among the patients, the lowest score for the rhinosinusitis diagnosis was 4 and the highest score was 8. The mean scores for group 1, 2 and 3 were 4.44±0.82, 4.86±1.17 and 5.57±1.51 respec-

Table 1. Demographic features and distributions of rhinosinusitis diagnostic criteria of the patients' groups

	Group 1 (middle CCS) 25 (%)	Group 2 (inferior CCS) 53 (%)	Group 3 7 (%)
Gender (M/F)	12/13	26/27	3/4
Mean age (years)	35.32±10.37	35.16±12.41	27.85±6.4
Facial pain/pressure	25 (100)	32 (60)	7 (100)
Nasal obstruction	12 (48)	47 (89)	7 (100)
Nasal discharge/discolored postnasal nasal drip	8 (32)	53 (100)	7 (100)
Hyposmia/Anosmia	1 (4)	-	2 (28)
Purulence in examination	4 (16)	16 (30)	4 (57)
Headache*	18 (72)	11 (21)	6 (86)
Halitosis*	-	5 (9)	2 (28)
Dental pain*	-	2 (4)	1 (14)
Fatigue*	5 (20)	13 (25)	4 (57)
Cough*	4 (16)	7 (13)	3 (43)
Ear pain/pressure/fullness*	2 (8)	6 (11)	3 (43)
Preoperative mean score	4.44	4.87	5.57
Postoperative mean score	0.64	0.40	0.43
P values	<0.001	<0.001	<0.001

*Minor criteria.

tively without statistically significant difference according to a one-way ANOVA test.

CT revealed concha ondularis of inferior conchae in 53 patients, concha ondularis of middle conchae in 25 patients and concha ondularis of middle and inferior concha in 7 patients (**Figures 1**-**3**). Bilateral concha ondularis was not found. Concha ondularis was found in 16 patients without any septum deviation, 10 middle and 6 inferior concha ondularis. Besides, concha ondularis was accompanied by septum deviation in the remaining 69 patients. Non-symptomatic maxillary sinus retention cysts and inferior concha hypertrophies due to septum deviation were found in 14 patients. Paradoxical middle concha was found in five patients.

Spur removal was performed in 16 of the patients alone. Six of these patients had local anesthesia and the other ten underwent endoscopic endonasal spur removal with general anesthesia. Both spur removal and septoplasty were performed in the remaining 69 patients under general anesthesia. Fourteen spur removal procedures were performed using the endoscopic endonasal method, and the other 55 spur removals were performed using classical septoplasty. Bilateral nasal tampon was placed for a day. No patient experienced a major complication from the procedure. Nasal synechia on the spur removal side was developed in all 5 patients. The synechiae were removed and treated with a placement of silastic sheet between concha and septum.

Patients were followed up with for 1.2±0.4 years. Significant difference was found between preoperative scores and postoperative scores (**Table 1**). CT was taken in 8 patients whose preoperative symptoms and signs recur. Concha compression was not reported in CT examination of these patients but rhinosinusitis was found in 3 patients (**Figure 1B**) and no radiological findings were present in 5 patients.

Discussion

CCS has not yet been identified as an entity in literature. Patients in this group have so far been classified under acute/chronic or recurrent rhinosinusitis, nasal septum deviation, rhinogenic headache/migraine or vascular headache, and allergic/vasomotor rhinitis, depending on the symptoms. Since the patients of the CCS group have particular characteristics, categorizing these patients in the other aforementioned groups may lead to inaccurate diagnoses and ultimately, incorrect treatments. This

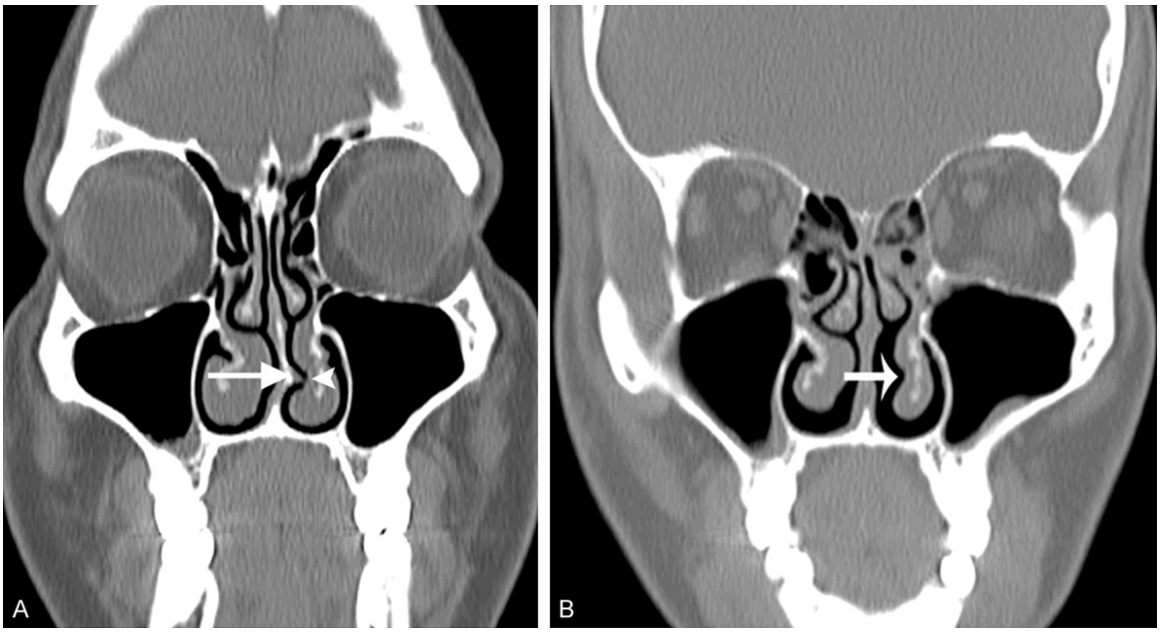

Figure 1. A. A 30 year-old male patient. Coronal CT multiplanar reformation image of paranasal sinus shows concha compression syndrome due to osseous spur which puts pressure on left inferior turbinate (arrow) and creates concha ondularis (arrowhead). B. Despite the disappearance of the concha compression, after 3 months preoperative symptoms occurring again 30 year old male patient; Coronal CT multiplanar reformation image of paranasal sinus after surgical removal of osseous spur demonstrates persistent left inferior concha ondularis (arrowhead) and bilateral rhinosinusitis symptoms.

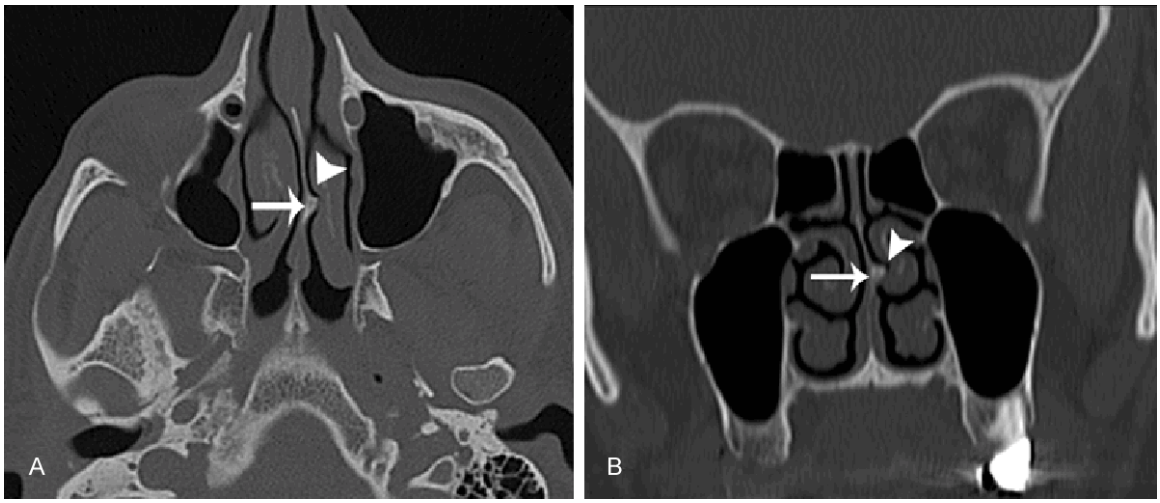

Figure 2. A 50-year old male patient. Transverse CT (A) and coronal CT multiplanar reformation (B) images of paranasal sinus show concha compression syndrome due to osseous spur which puts pressure on left middle inferior turbinate (larrows) and creates concha ondularis (arrowheads).

gives rise to significant costs. Clinically, CCS can mimic rhinosinusitis and nasal septum deviation, but CCS is different entity either radiologically or clinically.

CCS patients may show all symptoms and signs of rhinosinusitis. Patients will often report that they had experienced rhinosinusitis attacks. Furthermore, their detailed medical history differs by the intensity of the head-facial pain, post-nasal drip and nasal congestion. Based on the patient clinical history, we are able to discern the location of compression to a certain degree. A diagnosis of middle CCS is probable

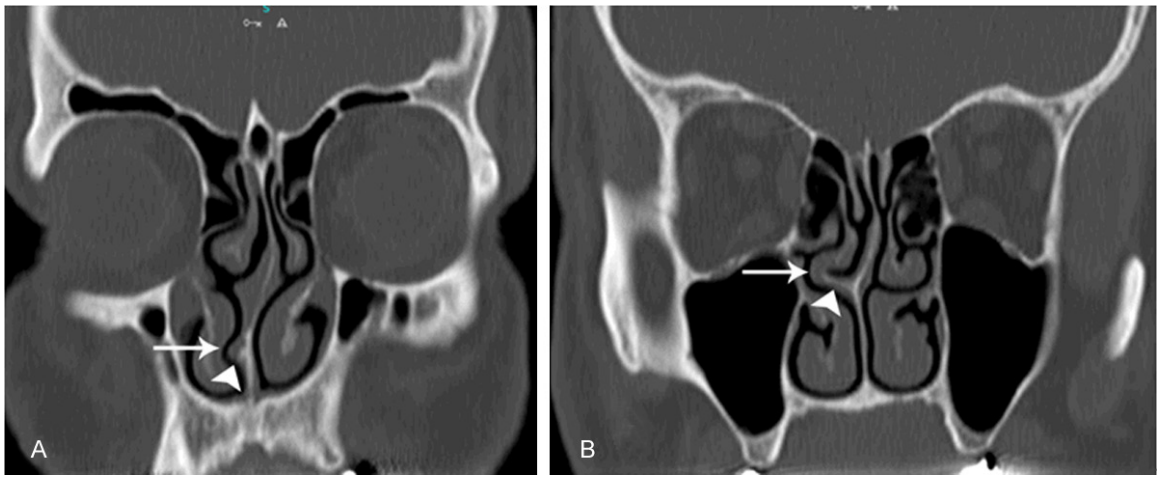

Figure 3. A 48-year old male patient. Coronal CT multiplanar reformation images of paranasal sinus show right inferior (A) and middle concha compression (B) syndrome due to nasal septal spurs which put pressure on inferior and middle turbinates (arrows) and create conchae ondularis.

for patients experiencing relatively more intense attacks of facial pain, headache or pressure, since middle concha is susceptible to pain as indicated in previous studies [2]. On the other hand "inferior CCS" is more probable for patients experiencing relatively more intense post-nasal drip and nasal congestion, since the inferior concha is rich in mucosal and submucosal glands. The response of inferior concha to compression is in the form of secretion and respiratory track congestion. In the case of both middle and inferior (mixed type) CCS, clinical history includes headache together with nasal congestion and post-nasal drip. We present the differences in rates of diagnostic symptoms and signs for rhinosinusitis in **Table 1**. Facial pain/pressure is seen most frequently in group 1, whereas nasal discharge/discolored post-nasal drip is most frequently encountered in group 2. This suggests that the concha structures responds to compression differently.

How is the diagnosis of CCS made? Patients with rhinosinusitis attacks, chronic rhinosinusitis or anterior cranial pain, migraine or similar headaches, who show nasal septal spur extending to the lateral wall contacting the conchae upon endoscopic examination, are candidates for CCS diagnosis. Paranasal sinus CT is then necessary for differential diagnosis. If the sinus CT reveals septal spur compression forming concha ondularis, the CCS diagnosis is made. Concha ondularis is a pathognomonic finding for CCS. Depending on the location of this finding, CCS can be divided as inferior CCS, middle CCS or mixed CCS.

Pathologic definitions such as paradoxical, bullosal, hypertrophic and polypoid-degeneration have been introduced regarding conchae. In the present study we introduce a previously undefined new concha morphology "concha ondularis" (CO) as a diagnostic indicator for CCS. CO may manifest itself both at inferior and middle concha. The structural change is a result of compression under the influence of septal spur. CO is seen as a wavy form in both coronal and axial CT scans. As shown in the figures, the septal spur produces an almost stabbing pressure on concha. The question of whether the concha can return to its normal morphology following spur removal remains unknown. We observed that the conchae had not returned normal in 8 cases (**Figure 1**). In addition, it is still matter of debate whether anatomical variations such as concha bullosa, septal deviation, nasal spur, malformed uncinate process, Agger nasi cell and paradoxic middle concha play a role in the etiopathogenesis of rhinosinusitis [3-5]. We did not search whether CO reported in this study plays a role in the etiopathogenesis of rhinosinusitis.

Symptomatic criteria defined by the rhinosinusitis work group in 1997 are widely accepted for the diagnosis of rhinosinusitis [1]. However; diagnoses based on those criteria are not always supported by endoscopy and radiology. Thus, the sufficiency of these criteria for diagnosis or treatment of rhinosinusitis has been debated. Indeed, Stankiewicz and Chow [6] performed nasal endoscopy and CT on a group

of patients with chronic rhinosinusitis (CRS) on the onset of their symptoms. Only 17 patients out of 78 (22%) showed positive endoscopy and CT findings, compared to 35 (45%) patients with negative endoscopy and CT findings. They reported that 55% of the CRS patients have supporting findings. Similarly, Bhattacharya et al. [7] reported the validity test on 202 patients, of which 178 met the symptomatic criteria. They did found no endoscopic or radiological findings in 50.6% of this patient group with positive symptoms. The important question is how to explain these positive symptoms, which are conclusively not supported by either nasal endoscopy or paranasal CT. Clearly, these patients do not have sinusitis, but then why do they show its signature symptoms? This is the fundamental question that led us to study CCS. A septal spur causing CCS may be detected both endoscopically and radiologically in many patients who have rhinosinusitis symptoms with negative endoscopic and CT findings. All CCS patients that we studied met rhinosinusitis diagnosis criteria and had been so far diagnosed many times as acute, recurrent or chronic rhinosinusitis. Unfortunately, as a result, these patients have been subjected to unnecessary antibiotic treatments. Thus, we recommend paranasal sinus CT scan to all patients suspected to have rhinosinusitis with a septal spur prone to concha compression upon endoscopic examination. We also recommend paranasal sinus CT scan even during a period of acute rhinosinusitis, since radiological examination, to our knowledge, is the only way to differentiate between rhinosinusitis and CCS. Concurrently, our study shows the necessity of endoscopic and radiological examination for CCS also in patients with intensive headache symptoms such as vascular headache, anterior cranial pain etc.

In the literature, the notion of mucosal contact is emphasized in the etiopathogenesis of rhinogenic contact point headache syndrome [8, 9]. Mucosal contact points appear between the middle and superior conchae and between the lateral wall and septum. With radiological and endoscopic advances, we can see that a triggering factor is responsible for these contacts [10]. The nasal mucosa is known for its ability to swell by way of vasomotor responses to environmental changes, hormones, emotions, mechanical stimulation (including pressure), and numerous pharmacological agents. Most patients identify wind, cold air, and viral upper respiratory tract infection as triggers. Stimulation of nasal mucosal receptors causes release of substance P, both centrally and peripherally, at the receptor site, which causes local vasodilatation, hypersecretion, smooth muscle contraction and the extravasation of plasma [11, 12]. As a result, it is presumed that patients with mucosal contact develop rhinogenic and neurogenic symptoms. Then how can be distinguished the contact point headache syndrome and CCS? The differential diagnosis can be made radiologically and clinically. In mucosal contact disease, concha morphology does not change radiologically, but in CCS, concha morphology takes form of concha ondularis. The patients with concha ondularis are diagnosed with CCS. It is also possible to distinguish mucosal contact disease from CCS through endoscopic examination. While it's not possible to see mucosal contact points during endoscopic examinations after the application of topical nasal decongestants, the concha compression spots remain readily visible. A review article for mucosal contact headache syndrome regards symptoms of mucosal contact as null hypothesis for facial pain [13]. While we agree on this view, we are of the opinion that the mechanisms whose pathophysiologies we reported above may be valid for concha compression as well. Besides, the aim of this study was not to address rhinogenical headaches or facial pain, but to point out that our patients meet the predefined rhinosinusitis criteria while not suffering from rhinosinusitis. We introduced the CCS syndrome in this study as an attempt to differentiate the diagnosis of such patients from rhinosinusitis.

Treatment of CCS is surgical and varies depending on the existence of septum deviation accompanying septal spur, which causes the compression. In the case of spur without septum deviation, endoscopic endonasal spur removal may be performed with either local or general anesthesia. In the cases of spur with septum deviation, spur removal with septoplasty is necessary. Although there was significant difference between preoperative and postoperative symptoms scores following spur removal, preoperative symptoms and signs recurred in 8 patients in postoperative period. Radiologically rhinosinusisits was reported in 3

of these patients while no radiological cause found in the remaining five. These patients deserve further investigation.

In conclusion, this preliminary investigation justifies further studies on CCS leading to rhinoneurogenic symptoms.

Disclosure of conflict of interest

None.

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