Co-Occurrence and Possible Role of Sinonasal Anomalies in Primary Acquired Nasolacrimal Duct Obstruction

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Objective: Our objective was to determine the co-occurrence of sinonasal anomalies and primary acquired nasolacrimal duct obstruction.
Methods: A total of 41 patients were enrolled in the study, of which 41 had primary unilateral acquired nasolacrimal duct (NLD) obstruction. All patients included in the study were evaluated by anterior rhinoscopy, endoscopic nasal examination, and paranasal sinus computed tomography (CT) in order to reveal significant nasal and paranasal pathology.
Results: A significant increase was noted in the rate of concha bullosa, inferior turbinate hypertrophy, osteomeatal complex disease, and maxillary sinusitis in favor of the study group ($P < 0.05$). Nasal septal deviation, irregularity of middle turbinate, paradoxical middle turbinate, ethmoidal sinusitis, and Onodi cell and agger nasi cell incidence were found to be high in the study group. However, none of this increase was statistically significant ($P > 0.05$).
Conclusions: Although primary acquired NLD obstruction seems to be an ophthalmologic problem, rhinologic problems have great importance in etiology. Detailed endoscopic examination and preoperative paranasal sinus computed tomography will reveal the possible role of nasal and paranasal structures adjacent to lacrimal sac in etiology of NLD obstruction. This will be effective both on conservative treatment and postoperative success in patients scheduled for surgery.

Key Words: Sinonasal anomalies, nasolacrimal duct obstruction

(*J Craniofac Surg* 2013;24: 497–500)

Acquired nasolacrimal duct (NLD) obstruction usually occurs in adulthood and is more common in women than men.[1] While primary acquired nasolacrimal duct obstruction is regarded as idiopathic, trauma, infection, inflammation, neoplasm, or mechanical factors play a role in the etiology of secondary acquired NLD obstruction.[2,3] However, because of the anatomical proximity of the lateral nasal wall to the lacrimal system, it has been suggested that diseases in this region may lead to primary acquired NLD obstruction.[4]

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Received February 22, 2012.
Accepted for publication November 3, 2012.
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The authors report no conflicts of interest.

ISSN: 1049-2275
DOI: 10.1097/SCS.0b013e31827c83ea

In some of the studies, it has been suggested that the most common cause of lateral nasal wall disease are paranasal sinus diseases.[5] In addition, some abnormalities such as concha bullosa and septum deviation have been suggested to be the causes of NLD obstruction.[6] However, the etiology of primary acquired NLD obstruction is still not exactly clear. Today, both ophthalmologists and otorhinolaryngologists are interested in NLD obstruction. However, preoperative evaluation and treatment of nasal and paranasal sinus anomalies may play a role in the etiology of NLD obstruction which is directly in the interest area of ENT physicians.

In this study, we want to emphasize the importance of whole examinations of nasal and paranasal sinuses before evaluating the primary acquired NLD obstruction as idiopathic. Because of this, we have tried to show the role of nasal and paranasal anomalies in the etiology of primary acquired NLD obstruction. We also thought that the evaluation of nasal paranasal anomalies will directly affect the success of both surgical and medical treatment.

PATIENTS AND METHODS

This study was performed in Haydarpasa Numune Hospital between June 2009 and March 2010. The study was approved by and performed in accordance with the guidelines of the Haydarpasa Numune Education and Research Hospital Ethical Committee. Informed consent was obtained from the parents. The patients who applied with the complaint of one-sided epiphora were referred our clinic by ophthalmologists. History of patients were taken carefully. Patients were asked when the complaints began, presence of rheum or redness in eyes, facial trauma including eyes, and an eye or nasal surgery before the complaints started. Patients with previous nasal and paranasal surgery, previous history of eye disease on the side of obstruction, and maxillofacial trauma were excluded from study. Nasolacrimal duct lavage was performed in all patients, and 41 patients without any advantage from lavage were included in study.

Evaluation of Patients

In patients with no flow by nasolacrimal duct lavage, radiography of sac with lipidol was taken. So after the administration of iodine to the inferior punctum of the eye at closed side, patients are put in sitting position and front-back direct sac x-rays were taken. In all cases that were included in the study, it is provided that the sac is full with lipidol and the obstruction is in the sac-NLD connection. Thus, canalicular obstructions were excluded. All patients included in the study were evaluated by anterior rhinoscopy, endoscopic nasal examination, and paranasal sinus computed tomography (CT). In both of the groups, significant nasal septal deviation, changes in middle turbinate (concha bullosa and paradoxical turbinate), inferior turbinate hypertrophy, osteomeatal complex disease, maxillary sinusitis, ethmoidal sinusitis, and anomalies such as agger nasi cell and Onodi cell were taken into account. Osteomeatal complex disease was defined as mucosal thickening in infundibulum, middle meatus, or hiatus semilunaris.

Comparison of Data

The comparison of all data was made between the nasolacrimal duct obstructed side and the healthy side for each patient. Changes in sinonasal pathologies between the sides were clearly noted.

Statistical Analysis

For statistical analysis of finding of study, NCSS 2007 and PASS 2008 Statistical Software (Utah, USA) programs were used. To evaluate the study data, descriptive statistical methods (mean and standard deviation) were used. Qualitative data were compared using chi-square test and Fisher exact test. Results were evaluated with 95% confidence interval, significance at $P < 0.05$.

RESULTS

When all cases in study were evaluated, nasal pathology was present in 39 of 41 in the nasolacrimal duct obstructed side (95.1%) and 24 of 41 in the healthy side (58.5%) ($P < 0.05$) (Table 1).

Concha Bullosa

Bullosa in the middle concha have been identified in 22 of 82 sides. Concha bullosa was observed in 15 of 41 in the nasolacrimal duct obstructed side (36.6%) and 7 of 41 in the healthy side (17.1%). The increase in the rate of concha bullosa in the nasolacrimal duct obstructed side was statistically significant ($P < 0.05$) (Table 1 and Figs. 1, 2).

Inferior Concha Hypertrophy

A total of 15 cases had hypertrophic inferior turbinate. Inferior turbinate hypertrophy was detected in 11 (26.6%) in the nasolacrimal duct obstructed side and 4 (9.8%) in the healthy side. Inferior turbinate hypertrophy distribution showed a significant difference between the nasolacrimal duct obstructed side and healthy side ($P < 0.05$) (Table 1 and Figs. 3, 4).

TABLE 1. Distribution of Nasal Pathology According to Sides

		Nasolacrimal Duct Obstructed Side (n = 41) n (%)	Healthy Side (n = 41) n (%)	P^a
Nasal pathology	Yes	39 (95.1%)	24 (58.5%)	0.001**
	No	2 (4.9%)	17 (41.5%)	
Concha bullosa	Yes	15 (36.6%)	7 (17.1%)	0.046*
	No	26 (63.4%)	34 (82.9%)	
Inferior concha hypertrophy	Yes	11 (26.6%)	4 (9.8%)	0.046*
	No	30 (73.2%)	37 (90.2%)	
Osteomeatal complex disease	Yes	8 (19.5%)	2 (5%)	0.047*
	No	33 (80.5%)	38 (95%)	
Maxillary sinusitis	Yes	10 (24.4%)	3 (7.3%)	0.034*
	No	31 (75.6%)	38 (92.7%)	
Septum deviation	Yes	15 (64.6%)	9 (22%)	0.145
	No	26 (36.4%)	32 (78%)	
Paradoxical middle concha	Yes	2 (4.9%)	0 (0%)	0.494[b]
	No	39 (95.1%)	41 (100%)	
Ethmoidal sinusitis	Yes	4 (9.8%)	1 (2.4%)	0.359
	No	37 (90.29%)	40 (97.6%)	
Onodi cell	Yes	1 (2.4%)	0 (0%)	1.000[b]
	No	40 (97.6%)	41 (100%)	
Agger nasi cell	Yes	1 (2.4%)	0 (0%)	1.000[b]
	No	40 (97.6%)	41 (100%)	

[a]Chi-square test.
[b]Fisher exact test.
*$P < 0.05$, **$P < 0.01$.

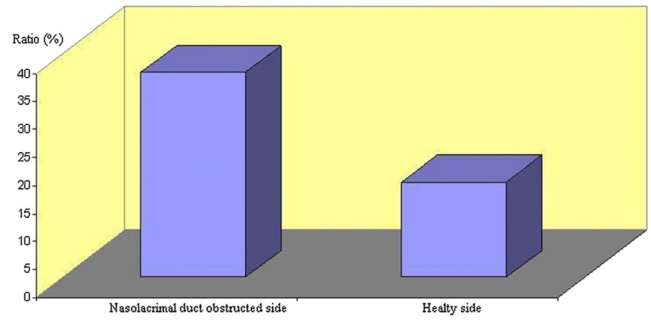

FIGURE 1. Concha bullosa distribution of the sides.

Osteomeatal Complex Disease

In the study group, osteomeatal complex disease was detected in 8 of 41 (19.5%) in the nasolacrimal duct obstructed side; in the healthy side, osteomeatal complex disease has been identified in only 2 of 41 (5%) patients. The osteomeatal complex disease increase in the nasolacrimal duct obstructed side was statistically significant ($P < 0.05$) (Table 1 and Fig. 5).

Maxillary Sinusitis

When we evaluated 41 computed tomography images, the findings in 13 of the cases were in favor of maxillary sinusitis. Looking at the distribution of these 13 patients, 10 of 41 (24.4%) in the nasolacrimal duct obstructed side showed signs of maxillary sinusitis while 3 of 41 (7.3%) in the healthy side in the control group showed signs of maxillary sinusitis. The increase in the rate of maxillary sinusitis in the nasolacrimal duct obstructed side was statistically significant ($P < 0.05$) (Table 1 and Fig. 6).

Other Pathologies

Nasal septal deviation, irregularity of the middle turbinate, paradoxical middle turbinate, ethmoidal sinusitis, and Onodi cell

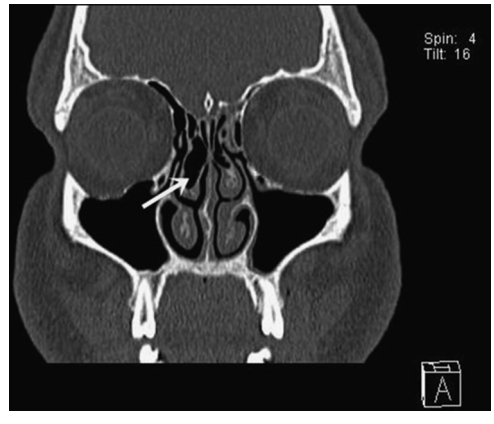

FIGURE 2. Concha bullosa at the affected side (white arrow).

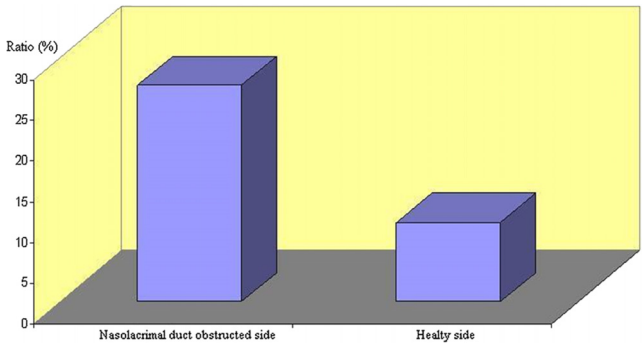

FIGURE 3. Inferior concha hypertrophy distribution of the sides.

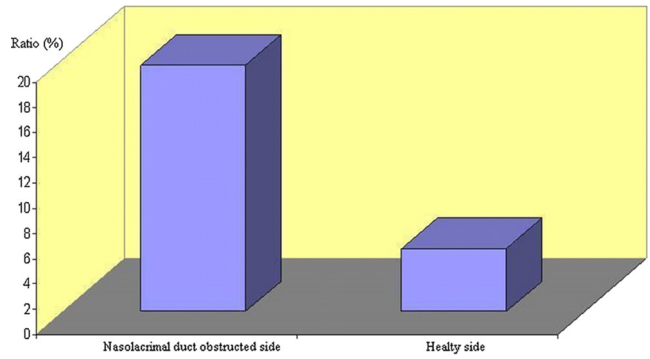

FIGURE 5. Osteomeatal complex disease distribution of the sides.

and agger nasi cell incidence were found to be high in the nasolacrimal duct obstructed side. However, none of this increase was statistically significant ($P > 0.05$) (Table 1).

DISCUSSION

In many countries, patients with NLD obstruction firstly refer to ophthalmologists. ENT physicians are consulted for a few of these patients. Nevertheless, nasal and paranasal anatomic structures are in close association to lacrimal canal, and this causes ENT physicians to be more close to lacrimal drainage pathology interventions. As a result of this anatomic intimacy, before planning both surgical treatment and conservative approaches, the opinion of the ENT physician must be taken. Studies have reported that in cases with acquired dacryocystitis, the obstruction side is frequently at the lower part of the nasolacrimal system, and this proximity of nasal and paranasal sinus pathology to this anatomical region often plays a role in the pathogenesis of dacryocystitis.[7] Garfin reported chronic rhinitis and chronic sinusitis especially ethmoiditis in 78%–100% of patients with dacryocystitis.[4]

In the literature except inflammatory disorders, publications about other sinonasal pathologies that may lead to primary acquired NLD obstruction are available.[8] It was found that in a study by Kallman et al in 87% of patients with NLD obstruction and in 63% of the control group, there were radiologic findings in favor of one or more rhinologic anomalies or sinus disease.[8] In our study, sinonasal pathology was observed at a rate of 95.1% in the group of NLD obstruction and 58.5% in the control group ($P < 0.05$).

Bale has reported nasal pathology (nasal septal deviation, inferior turbinate hypertrophy, rhinitis, or its complications) in 28% of patients with dacryocystitis.[9] But Auerbach reported that nasal pathology was rarely detected.[8]

Kallman et al reported nasal septal deviation at a rate of 39% in patients with NLD obstruction and 17% in the control group.[8] In a study by Sefi et al, it was reported that septal deviation was 65% in the study group and 40% in the control group.[10] In our study, septal deviation was observed in 36.6% of nasolacrimal duct obstructed side with NLD obstruction and 22% in the healthy side that was not statistically significant ($P > 0.05$).

In the same study done by Sefi et al, it has been reported that the incidence of maxillary sinusitis in patients with NLD obstruction was 60% and 35% in control group.[10] In our study, the rate of maxillary sinusitis was 24.4% in the nasolacrimal duct obstructed side and 7.3% in the healthy side which was statistically significant ($P < 0.05$).

Kallman et al have reported that the incidence of inflammation of ethmoids which was detected by CT of patients with acquired NLD was 39%, and in the control group this ratio was 25%. In our study, ethmoidal sinusitis was detected in 9.8% of the nasolacrimal duct obstructed side with NLD obstruction and 2.4% in the healthy side. In both our study and the study of Kallman, the relationship between the presence of ethmoidal sinusitis and NLD obstruction was not statistically significant ($P < 0.05$).

The rate of osteomeatal complex disease detected by CT of patients with NLD obstruction has been reported as 35% by Kallman and 40% by Sefi. This rate was 25% in Kallman and 10% in Sefi's control group.[8,10] Kallman has reported a statistically

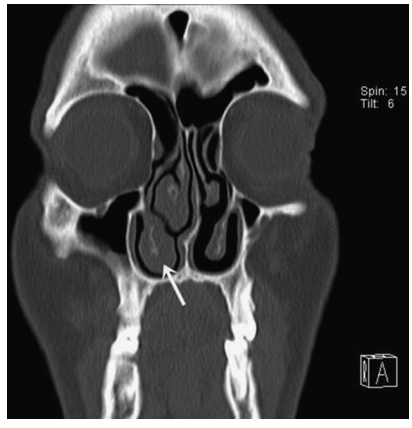

FIGURE 4. Inferior turbinate hypertrophy on the affected side (white arrow).

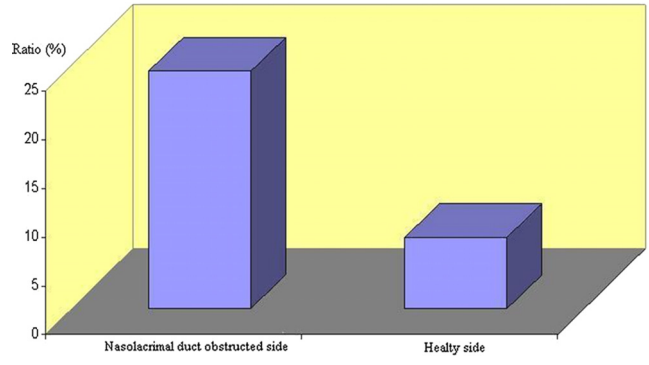

FIGURE 6. Maxillary sinusitis distribution of the sides.

significant relationship between osteometal complex disease and NLD obstruction development. However, Sefi has reported that the relationship between osteomeatal complex disease and NLD obstruction was not statistically significant. In accordance with Kallman, in our study osteometal complex disease was found in 19.5% of the nasolacrimal duct obstructed side and 5% of the healthy side, and the difference between the sides was statistically significant ($P < 0.05$).

Eyigör et al have reported inferior turbinate hypertrophy in 13.5% of patients with NLD obstruction.[11] Seyfi et al have reported this rate as 50% in patients with NLD obstruction and 25% in the control group.[10] In our study, inferior turbinate hypertrophy was found in 26.6% of the nasolacrimal duct obstructed side and 9.8% of the healthy side which was also significant ($P < 0.05$).

Kallman and Sefi have reported in their studies that there was no significant association between the presence of concha bullosa and NLD obstruction development. However, we detected concha bullosa at a rate of 36.6% in the nasolacrimal duct obstructed side and 17.1% in the healthy side. In our study, there was a statistically significant increase in the presence of concha bullosa in the cases of NLD obstruction ($P < 0.05$). A significant relationship was not observed between irregularities of middle turbinate or paradoxical middle turbinate and NLD obstruction. In addition, there was no significant correlation between agger nasi cell and Onodi cell with NLD obstruction.

Gray examined the patients with NLD obstruction and septal deformity. In Gray's study, it was found that every patient with the presence of septal deformity on the affected side had continued epiphora necessitating extra manipulation. Gray also pointed out that manipulation of palate, septum, and inferior turbinates were helpful techniques for the treatment of NLD obstruction.[12] In addition, Cervelli et al[13] investigated lacrimal flow in patients affected by septal deviations and turbinate hypertrophy, and evaluated changes after rhinoseptoplasty with dacryocystography and computed tomographic dacryocystography. They found that correction of septum and partial turbinectomy completely resolved the altered lacrimal flow in all patients. In our study, we demonstrated co-occurrence of sinonasal anomalies and primary acquired NLD obstruction. We did not evaluate the effect of any sinonasal surgery on the NLD obstruction treatment.

In spite of this limitation, our study has shown that although primary acquired NLD obstruction seems to be an ophthalmologic problem, rhinologic problems have great importance in etiology. Therefore, preoperative evaluation of patients with primary NLD obstruction should be done by ENT physicians. Detailed endoscopic examination and preoperative paranasal sinus CT will reveal a possible role of nasal and paranasal structures adjacent to the lacrimal sac in the etiology of NLD obstruction. This will be effective both on conservative treatment and postoperative success in patients scheduled for surgery. Therefore, this issue needs further studies that should investigate the effect of the treatment of sinonasal anomalies on the patients' outcomes of NLD obstruction surgery.

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