

Determining Association of Paranasal Sinus Abnormalities with Nasolacrimal Duct Obstruction

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ABSTRACT

Objective: To determine the association of Paranasal Sinus Abnormalities with Primary Acquired Nasolacrimal Duct Obstruction (PANDO).

Study Design: Comparative Cross-sectional Study.

Place and Duration of Study: Armed Forces Institute of Ophthalmology (AFIO), Rawalpindi Pakistan, from Jul 2021 to Feb 2022.

Methodology: A total of 90 patients were included in the study. 40 were part of the control Group while 50 formed the Study Group. Patients presenting with Nasolacrimal Duct Obstruction and Sinonasal Abnormalities were included in the study. All Data Analysis was performed using statistical package for social sciences (SPSS) 23.0 software (SPSS inc., Chicago, IL, USA).

Results: The Mean age of control group was 50.0±8.3 years while the mean age of patients in the NLDO group was 53.8±6.5 years. 32(64%) had right sided NLDO while 18(36%) had left sided NLDO. No statistically significant association was found between PANDO and Sino-nasal abnormalities such as Concha Bullosa, Chronic Sinusitis, Turbinate Hypertrophy and Septal Deviation ($p=0.05$).

Conclusion: No Association was found between Sino-nasal pathologies and their potential role in the development of PANDO. Further researches are needed on this topic especially ones exploring gender predilection and ethnicity to ascertain with certainty the potential relation of PANDO with paranasal pathologies.

Keywords: Concha bullosa, Chronic sinusitis, Primary acquired nasolacrimal duct obstruction (PANDO), Paranasal sinus abnormalities, Septal deviation, Turbinate hypertrophy.

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INTRODUCTION

Nasolacrimal Duct obstruction (NLDO) is one of the most common disorders seen in ophthalmological practice. Symptoms range from simple eye irritation, epiphora to blurred vision and dacryocystitis.^{1,2} NLDO is classified into congenital and acquired causes. Acquired obstruction may be primary or secondary.³ Primary Acquired Nasolacrimal Duct Obstruction (PANDO) was first described in 1986.⁴ This was followed by the proposal of a classification system in 1992 for Secondary Acquired Lacrimal Duct Obstruction (SALDO).⁵⁻⁷

While etiologies such as infections and inflammatory diseases are established causes of PANDO, the association of nasal and paranasal pathologies with PANDO has been a topic of much debate. It has been postulated the Sino-nasal abnormalities may play a role in the etiology of PANDO because of the proximity of these nasal structures to the Nasolacrimal Duct.^{8,9} Many studies have tried to find the association

of PANDO with abnormalities such as Concha Bullosa (CB), Chronic Sinusitis (CS), Septal Deviation (SD) and Turbinate Hypertrophy (TH). However while some studies have reported a positive association, many have also reported a negative association. As such the objective of our study was to add to the existing literature on this topic and hopefully help in reaching a definite conclusion about this possible association. Furthermore, this is the first prospective study exploring this topic in Pakistan.

METHODOLOGY

The comparative cross-sectional study was conducted at Department of Oculoplastics and Orbital Surgery at Armed Forces Institute of Ophthalmology (AFIO), Rawalpindi Pakistan, from July 2021 to February 2022. Ethical approval was granted by the Ethics Review Committee (ERC) at AFIO, (ERC dated: 22 December 2020). Non-probability convenient sampling technique was used.

Inclusion Criteria: Patients Patients of either gender aged 12 to 70 years, presenting with Nasolacrimal Duct Obstruction as well as those presenting with Paranasal Sinus abnormalities namely, Concha Bullosa (CB),

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Chronic Sinusitis (CS), Turbinate Hypertrophy (TH) and Septal Deviation (SD) were included.

Exclusion Criteria: Patients who did not present with the complaint of Nasolacrimal Duct obstruction or those with none or other paranasal sinus abnormalities, patients with injuries of the head and neck were excluded from the study.

Data was collected by a single investigator. Written informed consent was taken from all patients and precautions were taken to maintain their confidentiality. A sample size of 88 (44 in each group) was calculated for comparing two proportions, using Select statistical Services online keeping likely sample proportion in Group-1 to be 52% and likely sample proportion in Group-2 to be 31.6%, confidence level of 95% and power of 80%.¹ All categorical data was presented as percentages and frequencies. All continuous data was presented as Mean±Standard deviation or median and Inter Quartile Range (IQR). Median and IQR were used where continuous data was either positively or negatively skewed. Data was presented with the help of tables and graphs (Bar charts and Histograms). To identify differences between the NLDO group and the Control group, Chi-square test was used. A *p*-value of <0.05 was considered as statistically significant. All Data Analysis was performed using statistical package for social sciences (SPSS) 23.0 software.

RESULTS

A total of 90 patients were part of the study. About of 40(44%) formed the control group while 50(56%) presented with (NLDO). The Mean age of control group was 50±8.3 years while the mean age of patients in the NLDO group was 53.8±6.5 years. 20(50%) females and 20(50%) males formed the control group. NLDO group was comprised of 20(40%) females and 30(60%) males. 32(64%) had right sided NLDO while 18(36%) had left sided NLDO.

About of 14(35%) patients in control group had Concha Bullosa (CB) while 18(36%) patients in the NLDO group had it. The difference was not found to be statistically significant (*p*=0.92). About of 3(7.5%) patients in control group reported Chronic Sinusitis (CS) while 8(16%) patients in the NLDO group reported the same. The difference was also not found to be statistically significant (*p*=0.22). Turbinate Hypertrophy was seen in 13(32.5%) patients in the control group as compared to 17(34%) patients in the NLDO group. The difference between these two groups was not statistically significant (*p*=0.88). A much starker

clinical difference was noted between the control and NLDO groups in the case of septal deviation. Eight (20%) people had it in the control group while 18(36%) had it in the NLDO group. However, the difference was still not statistically significant (*p*=0.09) as shown in Table.

Table: Paranasal Sinus Abnormalities in Study Groups (n=90)

	Control Number	NLDO Number	<i>p</i> -value
Concha Bullosa (CB)	14(35%)	18(36%)	0.92
Chronic Sinusitis (CS)	3(7.5%)	8(16%)	0.22
Turbinate Hypertrophy (TH)	13(32.5%)	17(34%)	0.88
Septal Deviation (SD)	8(20%)	18(36%)	0.09

DISCUSSION

It is generally postulated that abnormalities of paranasal sinuses may play a role in the etiology of PANDO due to their close proximity with Nasolacrimal Duct. Many studies have recently tried to ascertain the incidence of PANDO in patients presenting with pathologies of nasal and paranasal sinuses namely, Concha Bullosa (CB), Chronic Sinusitis (CS), Turbinate Hypertrophy (TH) and Septal Deviation (SD).¹⁰⁻¹⁸ However, the results have been controversial, with no clear conclusion as to these conditions having a role in the etiology of PANDO. Our study sought to contribute to the existing literature on the topic and hopefully help to determine the answer to this question. Furthermore, this is the first prospective study exploring this topic in Pakistan. The mean age of our patient cohort was 53.8±6.5 years. Most were males (60%) and had Right sided NLDO. This was contrary to popular belief that PANDO is more common in females.³ We did not find a clinical or a statistical significance between PANDO and paranasal sinus abnormalities (*p*>0.05).

Concha Bullosa (CB) is thought to be a pneumatized cavity within a nasal turbinate. Habesoglu *et al.* found concha bullosa in the NLDO side in 36.6% of the cases while it was also seen on the healthy side in 17.1% cases. They found it to be statistically significant (*p*=0.046) ⁽¹³⁾. However, of all the studies we analysed this was the only one which reported a statistically significant result for concha bullosa. Alimoglu *et al.* Kallman *et al.* and Yazici *et al.* all reported statistically insignificant results (*p*>0.05).^{11,14,18} This was similar to the findings in our study which also postulated that Concha Bullosa did not play a significant role in the etiology of PANDO (*p*=0.92). Almost similar number of people had Concha Bullosa in the NLDO group

(36%) and the control group (35%) in our study. As such our observation of a lack of association between CB and PANDO is in line with most international studies and argues against the notion of CB being an etiology of PANDO.

Ethmoidal and Maxillary Sinusitis (CS) have been thought to play a role in the development of PANDO due to their close proximity to Nasolacrimal Duct. Habesoglu *et al.* reported maxillary sinusitis on the NLDO side in 24.4% cases as compared to 7.3% on the healthy side which was also statistically significant ($p=0.034$).¹³ Alimoglu *et al.* also reported chronic sinusitis (CS) in only 10% patients in the study group while no patients had it in the control group. They also found the result to be statistically significant ($p=0.04$).¹¹ Although we also found CS in higher proportions in the NLDO group (16%) as compared to the control group (7.5%), our result was not statistically significant ($p=0.22$). This difference in clinical and statistical significance could be attributed to the fact that our hospital was a specialized tertiary care ophthalmological institute and as such only the most severe cases of NLDO are referred which can not be managed in primary or secondary care. This would affect the generalizability of results.

Turbinate hypertrophy (TH) is thought to blunt the angle at which inferior meatus opens in the nasal cavity. As such it is thought to cause NLD obstruction as the secretions are not drained into the nasal cavity. Our study did not find any clinical or statistical significance in the association of TH and PANDO ($p=0.88$). These findings are similar to those reported by Dikici *et al.* and Alimoglu *et al.*^{11,12} Dikici *et al.* also classified inferior turbinate thickness on both right and left side into 4 different classes according to severity. The result was insignificant. 52% patients in the NLDO group as compared to 31.6% in the control group were observed to have TH in the study done by Alimoglu *et al.* Although this clinical significant result was not statistically significant ($p=0.06$), this was different to our study as we observed nearly equal number in both NLDO (34%) and control groups (32.5%).

Amongst all the Sino-nasal pathologies, Septal Deviation (SD) is thought to be the major contributor to the development of PANDO. Of the eight studies that we analysed, five reported a statistically significant association.^{11,12,14,16,18} With the help of Coronal Computed Tomography (CT) scan, Kallman *et al.* was able to report a statistically significant ($p=0.02$) association between septal deviation and PANDO.¹⁴

Although a study done by Yazici *et al.* found no association ($p=0.99$) between SD and PANDO when the study and control groups were compared as was seen in our study ($p=0.09$), a very strong association was seen when analysing the side of PANDO with the side of SD ($p=0.008$).¹⁸ SD was present on the same side as that of PANDO in an overwhelmingly 75% of patients. Similar results were reported in the study done by Alimoglu *et al.* and a very strong association was found between SD and PANDO when comparing study and control groups.¹¹ This was in direct contrast to the findings of our study. Although SD was observed in 36% patients in the NLDO group as opposed to a mere 20% patients in the control group, this clinically significant difference did not translate into a statistically significant result ($p=0.09$). Unfortunately this result is not in line to the results of most international studies and maybe due to a number of limitations of our study.

LIMITATIONS OF STUDY

Although our study is the first prospective study exploring this association in Pakistan, it has several limitations. Firstly, a larger sample size would have given more merit to the results. Secondly, it was a single institution study and as a result these patients would not have represented a snapshot of the general population. Furthermore, being a semi-private hospital, only patients who had the means to pay for the treatment would have presented to the hospital. Thirdly, as mentioned before, AFIO is a major tertiary care ophthalmological institute and generally more severe or recurrent presentations of a disease are referred. This would affect the generalizability of results as less severe presentations would have been managed at a primary or secondary care level.

Further researches on this topic may benefit in exploring the gender predilection and ethnicity in addition to these Sino-nasal pathologies in the development of PANDO.

CONCLUSION

It is postulated that Sino-nasal abnormalities may have a role in the etiology of PANDO. Our study did not find any evidence of the role of Sino-nasal abnormalities in the development of PANDO. These results support the findings of most current literature on this topic. However, our study did not support the commonly held notion of Septal Deviation being a cause of PANDO and was contrary to the latest available studies on the topic.

Conflict of Interest: None

Author's Contribution:

Following authors have made substantial contributions to the manuscript as under:

IT & AA: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

SAHN: & TAK: Concept, data acquisition, drafting the manuscript, approval of the final version to be published.

MAZ & UE: Study design, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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