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Research Article

Effect of Atrophic Rhinitis on Nasal Contours and Facial Symmetry: A Prospective Case-Control Study

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Abstract

Purpose: Atrophic rhinitis is a distressing malady of the nose, characterized by progressive atrophy of the mucosa underlying bone of turbinates, abnormal patency of nasal passages and presence of viscid secretions which rapidly dry up and form crusts. Classically, it gives rise to sclerotic changes which distort the nasal architecture and contour, giving rise to an unsightly appearance. Hence, this study was conducted to evaluate the changes in facial features in patients of atrophic rhinitis when compared to the normal unaffected population.

Materials and Methods: Patients coming into ENT OPD at Harsh ENT hospital were screened and diagnosed for atrophic rhinitis and categorised in the case group, whereas the other unaffected individuals were put into the control group. Various parameters like nasal and facial index, nasal and facial angles, facial thirds and facial height were compared between the two groups and results analysed.

Results: We have observed that atrophic rhinitis causes a change in various nasal and facial parameters. Facial index was found to be more and nasal index was also found to be decreased in patients of atrophic rhinitis. There was a slight decrease in the nasofrontal angle in these cases, but it was more obtuse in a few. In contrast, the nasolabial angle was observed to be more acute in atrophic rhinitis.

Conclusion: Through our study, attempted to analyse the changes caused by the destructive effects of atrophic rhinitis in the North indian population. To our knowledge, no such study has been reported in India or worldwide.

Keywords: Atrophic Rhinitis; Facial Angles; Nasal Index

Introduction

Atrophic rhinitis is a distressing malady of the nose, characterized by progressive atrophy of the mucosa underlying bone of turbinates, abnormal patency of nasal passages and presence of viscid secretions which rapidly dry up and form crusts [1]. It is also called ozaena due its typical foetid odour. The factors blamed for its genesis are autoimmunity, specific infections, hormonal imbalance, chronic sinus infection, heredity, poor nutritional status, and iron deficiency anemia [2]. Chronic bacterial infection of the nose or sinus may be one of the causes of primary atrophic rhinitis [3]. A few studies have shown that in atrophic rhinitis, there is no significant change in facial angles except that in few cases [4], where it becomes obtuse. A dominant inheritance trait for the development of primary atrophic rhinitis has also been proposed, according to studies conducted in Italy [5] and Ireland [6]. No such study has been conducted or reported in the Indian population till date, according to our knowledge and hence we performed this study to assess the changes in nasal and facial contours as a result of destruction due to atrophic rhinitis.

Study design

Prospective case control study.

Materials and Methods

Patients coming into ENT OPD at Harsh ENT hospital were screened and diagnosed for atrophic rhinitis and categorised in

the case group, whereas the other unaffected individuals were put into the control group. Various parameters like nasal and facial index, nasal and facial angles, facial thirds and facial height as well as mid and lower projections were compared between the two groups and results analysed. Data was collected using clinical photographs analysing the Frankfurt plane, zero meridian (Figure 1), facial landmarks (Figure 2), and facial thirds (Figure 3) and the angles [5,7] were measured using scales from those photographs. Data was analysed using SPSS software.

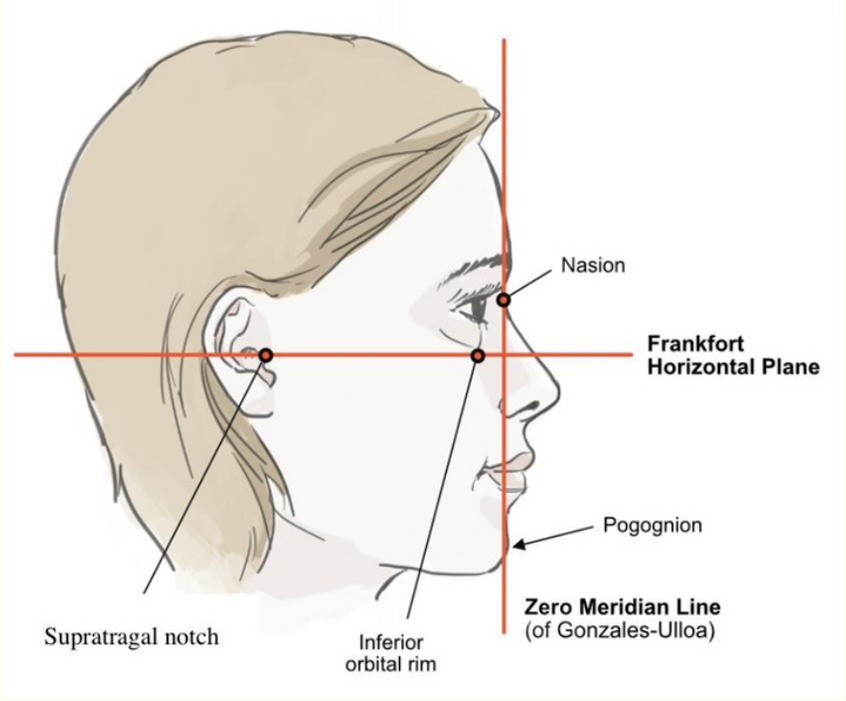

Figure 1: Frankfurt plane and zero meridian.

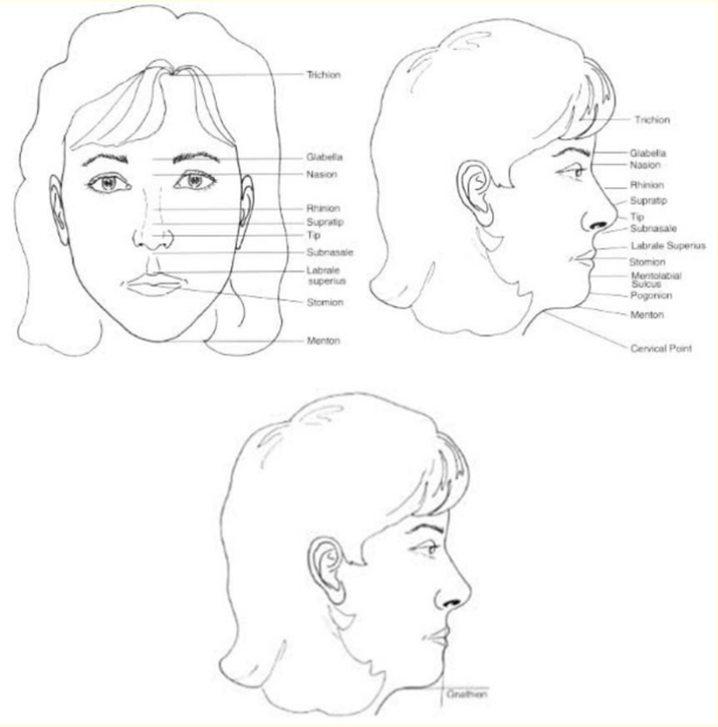

Figure 2: Facial landmarks.

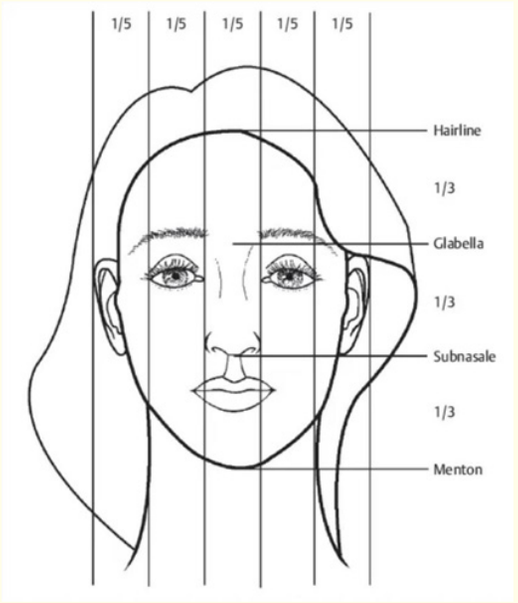

Figure 3: Facial thirds.

Results

Facial and nasal index

The mean value of facial index was found to be 81.74+6.40 in subjects with atrophic rhinitis as compared to 78.5+4.01 of control group. It was more in atrophic rhinitis and found to be insignificant (P > 0.05). Facial index (FI) was 66-86 (indicting medium face) in 12(75%) subjects of atrophic rhinitis when compared to 49 (98%) subjects of control group. The medium faces were found more in (23%) subjects of control group. The FI was found to be more than 86 (indicating short face) in 4 (25%) subjects of atrophic rhinitis in comparison to 1 (2%) subjects of control group. The short faces were found more in (23%) subjects of atrophic rhinitis as compared to control group. The mean value of nasal index (NI) was found to be 71.58+9.20 in atrophic rhinitis as 72.07+10.28 in control group. It was seen that NI was less in atrophic rhinitis. However this was not found significant (P > 0.05). The NI was found between 70-85 (indicating medium nose) in 8(50%) subject with atrophic rhinitis as compared to 28 (56%) in control group. Medium nose was found more in 6% subjects of control group (Table 1).

Table 1: Facial and nasal index in control group and atopic rhinitis group.

	Parameters	Control. Group	Atrophic rhinitis
Facial index	RANGE 90th percentile	67.78-88.0 83.72	73.58-93.61 88.88
	Mean +- 50	79.50+-4.01	81.74-6.4
	<66 (elongated face)	-	-
	66-86 (medium face)	49 (98%)	12 (75%)
	>86 (short face)	1 (2%)	4 (25%)
Nasal index	RANGE 90th percentile	53.33-83.33 81.81	60.00-85.71 83.33
	Mean +- 50	72.07+-10.28	71.58+-9.20
	<70 (long narrow nose)	22 (44%)	7 (43.75%)
	>70-85 (medium nose)	28 (56%)	8 (50%)
	Parameters	Control. Group	Atrophic rhinitis
	>85 (flat broad nose)	-	1 (6.25%)

Nasal and facial angles

The mean value of nasofrontal angle was found to be 131.93+-11.55 in subjects with atrophic rhinitis as compared to 132.50+6.84 in control group, thus showing an insignificant difference. Nasofrontal angle was found to be 135 in 6 (37.5%) subjects of atrophic rhinitis as compared to 11 (22%) subjects of control group. It was more obtuse in 15.50% more subjects with atrophic rhinitis as compared to the controls (Table 2, 3). The mean value of nasofacial angle was found to be 35.31 in subjects with atrophic rhinitis in comparison to 36.94 in control group. It was less in atrophic rhinitis group. This was insignificant (P > 0.05).

Table 2: Nasal and facial angles measured in Control Group.

	Nasofrontal angle		Nasofacial angle		Nasolabial angle			Columellaralar angle
Angles-in degrees —>	115-135	>135	23-40	>40	<90	90-120	>120	
No. of subjects	39 (78%)	11 (22%)	46 (92%)	4 (8%)	4 (8%)	44 (88%)	2 (4%)	
Range	115-148		29-43		70-126			110-180
90th/percentile	140		40		120			152
Mean+-Sd	132.50+-6.84		36.94+-3.76		103.16+-13.05			138.20+-13.78

Table 3: Nasal and facial angles measured in Atrophic Rhinitis Group.

	Nasofrontal angle			Nasofacial angle	Nasolabial angle		Columellaralar angle
Angles-in Degree S—>	<115	115-135	>135	23-40	<90	90-120	
No. of Subject S	1 (6.25%)	9 (56.25%)	6 (37.5%)	13 (81.25%)	6 (37.5%) (8%)	10 (62.5%)	
Range	110-150			30-46	50-112		120-180
90th/percentile	146			42	100		152
Mean+-sd	131.93+-11.55			35.31+-5.58	86.56+-16.43		143.37+-14.71

Nasofacial angle was found to be less than 40° (81.25%) in subjects with atrophic rhinitis as compared to 46 (92%) of control group. Nasofrontal angle was observed to be more in (10.75%) subjects of control group as compared to atrophic rhinitis. The mean value of nasolabial angle was found to be 86.56+16.43 in subjects with atrophic rhinitis as compared to 103.16+13.05 in control group. This was found to be more acute in atrophic rhinitis. This was found highly significant statistically (P < 0.001). The mean value of columellar angle was 143.3714.71 in atrophic rhinitis compared to 138.20+13.78 in the control showing a significant difference (P < 0.01).

Mid and lower facial projections

The average face was found in 9 (56.25%) subjects of atrophic rhinitis as compared to 37(74%) subjects of control group. Average face was found more in (18.75%) subjects control group. The ante face was found in 7(43.75%) subjects of control group. Ante face was observed more in 19.75% subjects of atrophic rhinitis group as compared to controls. Only one retroface (2%) was found in control group. No retroface was found in atrophic rhinitis. The pogonion was seen normal in 6(37.5%) subjects with atrophic rhinitis as compared to 17(34%) subjects in control group. Normal pogoninon was seen in (3.5%) more subjects of atrophic rhinitis. The protruded pogonion was found more in 8.5% subjects of atrophic rhinitis whereas retruded pogoinon was found more in (12%) subjects of control group (Table 4,5).

Facial thirds and THF

The mean value of total facial height (TFH) was 5.0+0.7 cms in atrophic rhinitis as compared to 5.2+0.6 cms in control group. This statistically insignificant (P>0.05). The mean values of upper

Table 4: Mid and lower facial projections in control group.

Face Type			Pogonion Type		
Average	Ante	Retro	Normal	Protruded	Retruded
37 (74%)	12 (12%)	1 (2%)	17 (34%)	2 (4%)	31 (62%)

Table 5: Mid and lower facial projections in atrophic rhinitis group.

Face type			Pogonion type		
Average	Ante	Retro	Normal	Protruded	Retruded
9 (56.25%)	7 (43.75%)	-	6 (37.5%)	2 (12.5%)	8 (50%)

facial height (UFH) and midfacial height (MFH) did not differ in the control group and the atrophic rhinitis group. It was found to be 1.6+0.2 cms. The mean value of lower facial height (LFH) was 2.0+0.3 cms, in atrophic rhinitis as compared to 1.9+0.3 cms of control group. LFH was observed more in atrophic rhinitis. This was statistically insignificant (P > 0.05). UFH, was less than one third of subjects, MFH, 34(68%) in 12(75%) TFH in 14(87.5%) subjects as compared to and 36(72%) of control group. LFH was found to be more than one third of TFH in 16(100%) subjects with atrophic rhinitis as compared to 43 (86%) of control group. LFH was observed more in 14% subjects with atrophic rhinitis (Table 6).

Table 6: Facial thirds and TFH in control group and atrophic rhinitis.

	Control Group n = 50				Atrophic Rhinitis Case Group n = 16			
	TFH	UFH	MFH	LFH	TFH	UFH	MFH	LFH
Range	3.9-6.4	1.2-2.0	1.1-2.2	1.3-2.9	3.7-6.5	1.2-2.1	1.2-2.0	1.6-2.2
90th/percentile	6.0	1.9	2.0	2.2	5.7	1.7	1.8	2.1
mean+-50	5.2+-0.6	1.6+-0.2	1.6+-0.2	1.9+-0.3	5.0+-0.7	1.6+-0.2	1.6+-0.2	2.0+-0.3
>1/3rd of TFH		10 (20%)	11 (22%)	43 (86%)		1 (6.25%)	2 (12.25%)	16 (100%)
Equal to 1/3 of TFH		6 (12%)	3 (6%)	3 (6%)		1 (6.25%)	2 (12.25%)	0 (0%)
<1/3rd of TFH		34 (68%)	36 (72%)	4 (8%)		14 (87.5%)	12 (75%)	0 (0%)

Discussion

Atrophic rhinitis is chronic nasal condition, characterized by a sclerotic change in the mucous membrane, abnormal patency of the nasal passages due to atrophic changes in the mucosa and underlying bones, and thick viscous secretions that emit a foul odor when dry [2]. Several theories have been proposed to explain the etiological factors that can contribute to the development of atrophic rhinitis. These include heredity factors [5,6], infections, and infectious agents [8], developmental disorders [9], nutritional deficiencies [10,11], autonomic disorders [12], endocrine imbalances [13], allergy, and immune disorders [10,11] and phospholipid deficiency [14].

In our study, we have observed that atrophic rhinitis causes a change in various nasal and facial parameters. Facial index was found to be more in patients of atrophic rhinitis but the difference from the control group was not statistically significant. The nasal index was also found to be decreased in these patients.

There was a slight decrease in the nasofrontal angle in these cases, but it was also not statistically significant. It was more obtuse in a few cases i.e. 15% of the patients. In contrast, the nasolabial angle was observed to be more acute in atrophic rhinitis, which was also statistically significant.

The average face was found in 9 (56.25%) subjects of atrophic rhinitis as compared to 37(74%) subjects of control group. Ante face was observed more in 19.75% subjects of atrophic rhinitis group as compared to controls. Only one retroface (2%) was found in control group. No retroface was found in atrophic rhinitis. Normal pogoninon was seen in (3.5%) more subjects of atrophic rhinitis. The protruded pogonion was found more in 8.5% subjects of atrophic rhinitis whereas retruded pogoinon was found more in (12%) subjects of control group

The mean values of upper facial height (UFH) and midfacial height (MFH) did not differ in the control group and the atrophic rhinitis group. LFH was observed more in atrophic rhinitis, but both of these findings are found to be not statistically significant.

It has also been proposed that and the damage to nasal mucosal lining can predipose the patient to secondary fungal infections as well, as depicted in a study conducted by Effat KG., *et al*. [15] in Egypt, in which fungal elements, of aspergillus species, were isolated in thirteen patients.

An extensive review conducted in 2023 inluded those articles that provided information regarding the types, pathogenesis, types, the impact of management on lifestyle and the new treatment modalities [16]. It showed that Atrophic Rhinitis (AR) has mainly 2 types- primary and secondary, that can affect various populations and can have a specific clinical presentation. Primary AR is more common in females and warm countries. Secondary AR is mostly seen in the industrialized world and is more frequent mong adults having a pre-existing systemic disease, or those who have undergone an extensive nasal surgery, or have experienced nasal trauma.

Conservative management of this condition is effective, safe and inexpensive. Nasal hygiene, well-balanced diet, cessation of smoking, and an early identification and management of this nasal pathology can prevent AR [16].

After an extensive literature search, we found there is a lack of any similar studies that have compared the changes in nasal architecture due to the destructive effects of atrophic rhinitis, conducted in the past. Such studies need to be performed in different races and geographical areas in order to compare the effects of atrophic rhinitis on different populations. Additionally, it is important to note that the destruction caused by atrophic rhinitis can be corrected using various modalities like augmentation rhinoplasty, once the acute infective and crusting stage of the disease has resolved; cross-linked hyaluronic acid injection in the submucosal lining [17]. Further research is warranted in this aspect so as to promote the use of rib [18] or auricular cartilage [19] and synthetic implants [20] in augmentation rhinoplasty in these patients. Hence, it is imperative for such studies to be performed in order to create a paradigm shift in the management of atrophic rhinitis and to reverse the deformities created by this condition.

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