



DESERT NOSE SYNDROME (RHINITIS SICCA ANTERIOR) A NEW TYPE OF IRRITANT RHINITIS – A CLINICO-PATHOLOGICAL RESEARCH OF 93 CASES IN KUWAIT

Otorhinolaryngology

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ABSTRACT

In this clinico-pathological research we describe the “Desert nose syndrome” which is a unique disease in populations exposed to chronic desert environment, which leads to slow destruction of nasal muco-ciliary mechanism and progressive nose block. Though the clinical presentation is similar to Rhinitis sicca Anterior, this disease has unique clinical and endoscopic appearance. Computed tomography of the Para-nasal sinuses is strikingly normal throughout the course of disease and pathology fully confined only to nasal mucosa.

KEYWORDS

Non allergic perennial rhinitis, Rhinitis sicca anterior, Desert climate, Non-inflammatory, non-allergic rhinitis

Introduction

Rhinitis sicca anterior (Desert nose syndrome), a novel pathological condition met in patients of out-lying provinces of State of Kuwait. Desert nose syndrome is the result of chronic nasal exposure to very high temperature and extremely dry air, leading to chronic mucociliary damage and squamous metaplasia. Desert nose syndrome has a very unique clinical and endoscopic picture.

Background

Kuwait is a country nestled between Iraq and Saudi Arabia. Kuwait consists of predominantly desert type climate and sees little rainfall throughout the in summer temperatures range from 42 to 48 °C (108 to 118 °F) and peak summer temperature can reach up to 54.0 °C (129.2 °F) (CIA world book of facts). This is highest recorded temperature in Asia and also the third highest in the world (Wikipedia). Tumultuous Sand storms are frequent in March and April which are nothing but dry winds carrying huge quantities of fine dust. Most of the human population survives in this extreme climate by using Air conditioners. Entire buildings and shopping malls are air-conditioned.

Jahra lies on the route to the border town of “Abdali” and “Salmi”, the predominant population of Jahra is “Bedouins”, these are desert wandering nomads who travel from place to place (CIA world book of facts). Constant exposure to dust and heat leads to a peculiar syndrome complex of a unique type of Non-inflammatory, non-allergic rhinitis, Rhinitis sicca anterior – Desert nose syndrome.

Materials and Methods of research

This study was carried out in a private clinic of Jahra an out-lying province of Kuwait from June 2015 to August 2016 (12 months). From the pool of patients consulting our Rhinology clinic, Rhinoscopic evaluation, symptom assessment, and objective testing by Nasal Peak Inspiratory Flowmetry (NPIF) were used in Diagnosis of Desert nose syndrome. Nasal endoscopy was done on patients who had clinical history suspicious of this disease. This was followed up with NPIF. Radiological imaging like X-ray of Para nasal sinuses and a Computed tomography was done in select patients, especially who had clinical suspicion of chronic sinusitis or Nasal Sino-nasal polyp or fungal sinusitis.

Written and verbal consent was obtained before the investigations were carried out and permission of hospital ethical team was taken.

Type of study

This was a cross-sectional descriptive epidemiological type of study. Research was done in a hospital Rhinology clinic, and cases were analysed from cohort of patients presenting to the author with a variety of nasal complaints. A diagnostic picture was gradually formed by unusual clinical presentation of this Geo-pathological disease syndrome.

Observation

A total of 93 cases were studied to list out the clinical picture of this disease condition. The main symptoms of this condition were Nose block, Headache and dryness of nose. Occasional patient presented with anterior epistaxis, crusting and watery nasal-discharge. Sinusitis was excluded by absence of mucoid or purulent nasal discharge, Cough and Post-nasal drip. The main diagnostic clinical symptoms are shown in table 1a.

Table 1a. Clinical symptoms of Desert nose Syndrome, these are present for nine or more months each year

Symptoms of Desert nose syndrome	Percentage of patients	Number of cases
Nasal block	100%	93 / 93
Headache	95%	88 / 93
Dryness of nose	90%	84 / 93
Rhinorrhoea/ only watery discharge	80 %	74 / 93
Sneezing more than 5 times a day (Hansen B et al.,2002)	71%	66 / 93
Decreased sensation of smell	18%	17 / 93
Bleeding from the nose - Occasional	12%	11 / 93

In addition, Ophthalmological evaluation for Irritant conjunctivitis, medicine referral for presence of Bronchial Asthma and Dermatological evaluation for Atopy or Eczema was done. Height was measured in order to correlate with the Peak Nasal Inspiratory Flow score.

Rhinitis Quality of Life questionnaire was used in this study, all subjects completed a Sino-nasal Outcome Test or SNOT- 22 questionnaire (Ottaviano et al., 2014)(Hopkins C et al., 2009). We found the average SNOT-22 score was found to be 55, scores range is from 0 to 110, 22 question each carrying score of 0 to 5 (Zeiger RS et al.

1991).

Diagnostic Nasal Endoscopic Picture

The classical picture of Rhinitis sicca was absence of moist texture of mucosa of septal mucosa and anterior nasal cavity likened to “desert” in the nose. Mottling and multiple dots like adherence like “sand-paper” were seen in the mucosa. Sinusitis was excluded with absence discharge from any of the sinus meatus. Typical endoscopy findings are shown in figure number 1. This Endoscopic picture was found in all of the patients (100%).

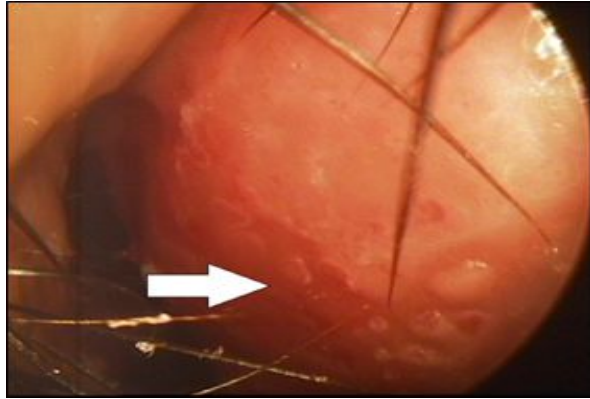


Figure1a. Typical patient with Dry looking septal mucosa in the nasal valve region looking like a “desert” in the nose with multiple dry mottled mucosa on the lower part of septum, “sand-paper” appearance are classical of this disease.

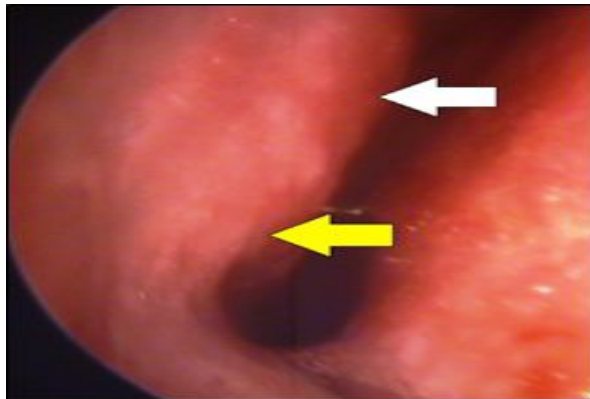


Figure1b. White arrow points to normal mucosa which looks moist, yellow arrow points to with Dry looking septal mucosa looking like a “desert” in the nose, with mottled “sand paper” appearance of septal mucosa on left. This is due to squamous metaplasia of the epithelium in the valve region.

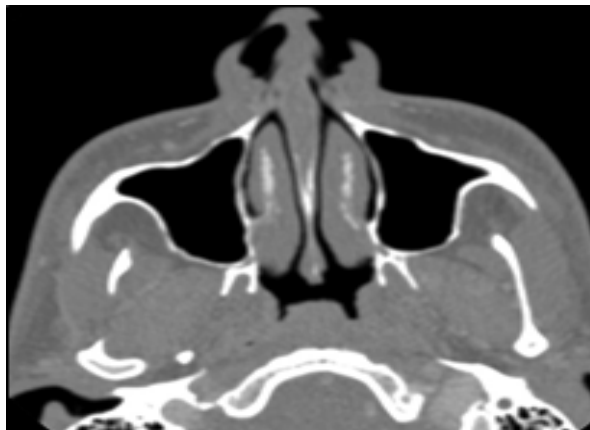


Figure1c. Computed tomography C.T image of a typical case, showing absence of any disease in the Maxillary antrum effectively differentiates this disease from any other Sinus disease. Only finding is the Inferior turbinate hypertrophy. This was found in all cases (100%)

Demographics of cases in our research

The demographic data of the cases and their Peak flow rate data, included in this study follow in Table2. Peak Nasal Inspiratory Flow rate was found to be markedly reduced from the population average from other similar research data (Ottaviano G et al., 2006). The population PNIF data of Kuwait population was not available, is left for future research. Total Eosinophil count was done to find systemic allergy.

Table 2 Mean age of cases with PNIF readings, which is the average of 3 consecutive measurements taken as per available research guideline on this investigation (Taylor G et al., 2014).

Demographic variable	Average
Mean age of presentation (Years)	23 years
Sex	75 males (81%) 18 females (19%)
Height of patient (centimetres)*	173 (centimetres)
PNIF (L/min)	100.56 L/min
Peak Nasal Inspiratory Flow rate	
Ethnicity	Kuwaiti 37% (34/93) Bedouins 33% (31/93) Saudi Arabians 18% (17/93) Others – Indians, Egyptians, Sri-Lankans 12 % (11/93)
Smokers	85 % (79/93)
Average reported age of onset of complaints (Togias 1990)	21.5 years
Total Eosinophil Count – Average (X 10 ⁶)	220

* Height data is correlated with the Peak Nasal Inspiratory Flow rate, hence included (Ottaviano et al., 2014).

Histopathology of affected mucosa

Biopsy of the affected mucosa was done to characterize the histopathology of the lesion. Figure1d shows a photomicrograph of the affected mucosa showing keratinisation of columnar epithelium with a sub-mucosal inflammatory infiltrate, this is contrast to the traditional thought (Zeiger RS. 1991 et al. 1991) that Rhinitis sicca is a Non-inflammatory type of Rhinitis.

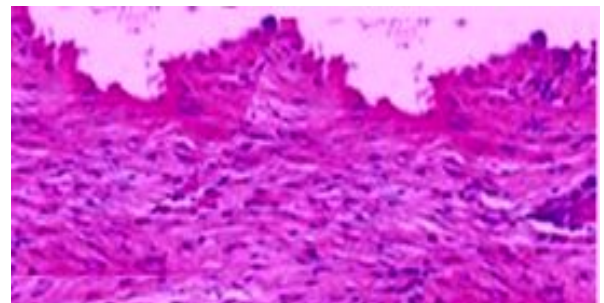


Figure1d. Histopathology of the affected mucosa showing squamous metaplasia with an inflammatory infiltrate, unlike traditional opinion of Rhinitis sicca (Zeiger RS. 1991 et al. 1991)

Statistical analysis

Various statistical tests were carried out using PAST Statistical software package. A Confidence interval of 95% (p=0.05) was setup for the entire Hypothesis tested in this study. Analysis of variance test (ANOVA), Pearson's Chi-square test and Linear regression modelling were employed in order to compare the NIPF according to demographic and clinical characteristics. When condition of normality of data was doubtful, we used a nonparametric test to compare two samples such as the Mann-Whitney. Members of the cohort were normal patients who were tested and found free of this disease. Student's t test using separate variance for two independent population means was used at 95% confidence interval to conclude statistical difference.

Discussion

Up to 50% of patients presenting in the Rhinology clinic may be suffering from some form of Non-allergic Rhinitis (Claus Bachert,

2008). The demographic characteristics of this study with 93 individuals, mostly males - $n = 75$ (80.6%) in relation to females $n=18$ (19.3%). Disease was common among Ethnic Kuwaiti population 37% cases, but since was carried out in a private hospital; this may be due to higher hospital bias. In our research, 79 individuals (85%) were smokers or had smoked more than 5 years, this was strongly statistically associated with this disease ($p=0.0045$). According to Togias A. (1990) Non allergic Perennial Rhinitis has a later age onset in contrast to Allergic Rhinitis which begins in childhood at typical age less than 20 years. Our study points out that the average age of onset of this condition is mean value of 21.5 years following a typical clinical picture of Non allergic Perennial Rhinitis.

Average Peak Nasal Inspiratory Flow rate (PNIF) value observed was 100.56 ($n=93$ Standard deviation was 46.3, compare mean 142.8 SD 27.9 degree of freedom is 31 Table $t=2.576$ data from ref (Ottaviano et al., 2014) was used this was not statistically significant. There is no significant difference in the nasal air flow in these cases. Total Eosinophil count did not show significant increase in this research.

With regards to clinical symptoms the diagnostic criteria is similar as that of Perennial Non-allergic Rhinitis, a prolonged history of more than 9 months (Claus Bachert, 2008) with predominant symptoms of nasal blockage, dryness of nose, watery discharge from nose, sneezing and headache. This is virtually indistinguishable from other causes of Non-allergic Rhinitis like Occupational and Hormonal rhinitis (Claus Bachert, 2008).

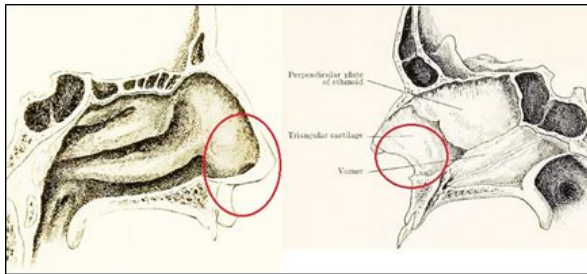


Figure2a. On the right is the cross-section of lateral wall of nose, on left cross-section of nasal septum, showing the areas predominantly affected in Desert nose syndrome. This is a Public domain images with modification.

The diagnostic endoscopy picture is where this disease entity stands as a unique one, with squamous metaplasia of columnar epithelium and mottling of the long standing metaplastic mucosa. Imaging modality serves to confirm that this is a pure rhinological disease process with all of the Para-nasal sinuses free of disease.

As per research of Feron CJ et al (1986), a variety of air pollutants can affect the mucosa of the nose, namely dry and hot air and fine sand. Sand particles are Silica or Silicon dioxide and are composed of particles of size ranging 0.0625 mm to 2 mm, as described by Geologists (Wikipedia page on sand). Crystalline silica dust is a known contributor to a variety of Lung diseases, characterized by inflammation of airways and scarring, which are described as Silicosis (Castranova V et al. 2000). Similarly, silica elicits inflammation and pathological metaplasia of nasal mucosa in Desert nose syndrome.

In addition pollen from flowers of Date palm (*Phoenix dactyfera* of Family : Arcaceae) can cause allergic symptoms like pollen allergy in rest of the world. In addition oil refineries in Kuwait release a variety of fumes like Poly aromatic hydrocarbons which can influence the health of nasal mucosa. Petroleum distillates are known culprits to cause allergy (Dean M Clerico, 2001).

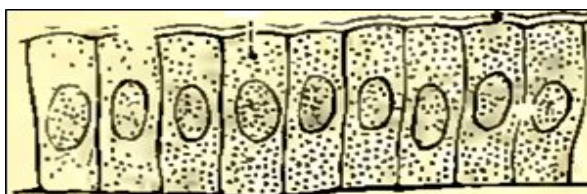


Figure2b.A Schematic picture showing columnar epithelium, with tall, cylindrical cells, are typical of respiratory mucosa lining the nose. This is a Public domain image.

According to Dean M Clerico (2001), Nasal respiratory epithelium on chronic exposure to Chemicals can undergo squamous metaplasia, Hyperkeratosis and Glandular hyperplasia. This is very much evident in Desert nose syndrome.

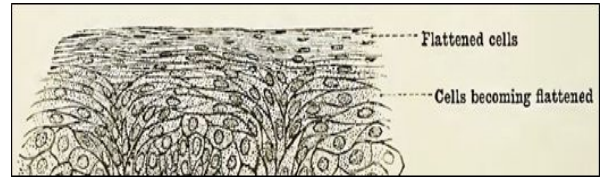


Figure2c. Schematic picture showing stratified, squamous epithelium, with flat cells in the outer layer and progressive keratinisation of cells. This is a Public domain image.

Suggested Treatment strategies

Traditional treatment of Rhinitis sicca is emollient sprays, Saline nasal sprays and emollient nasalointments, aimed at reducing the dehydration of mucosa and promotes regeneration. Our study has found plenty of inflammation in sub-mucosa which means minimal use of inhaled Nasal corticosteroid sprays would promote restoration of columnar respiratory mucosa. But inhaled corticosteroids themselves promote dryness of mucosa, hence must be dosed judiciously. Efficacy of these various treatments is left for further future analysis.

Conclusion

Desert nose syndrome is a unique condition resulting from chronic unprotected exposure to high temperature, fine sand and dry hot air of the desert, this condition is characterized by chronic nasal blockage and dryness of nose. Nasal endoscopy picture is remarkable with squamous metaplasia of valve area and septal mucosa, hyperkeratosis and glandular hyperplasia. Unique sub-mucosal inflammation was noted. Minimal use of inhaled Nasal corticosteroids could be beneficial in presence of inflammation.

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