Research Article

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Airway Analysis of Pharynx at Level of Epiglottis Among Snorers and Non Snorers: A Cross Sectional Study

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ABSTRACT

Background: Snoring which falls within the spectrum of sleep-related breathing disorders considered to be common symptom of airway obstruction. Over the years, lateral cephalometric radiography has become one of the standard diagnostic tools to evaluate skeletal and soft tissue abnormalities contributing to obstruction, and have been the most common imaging method in evaluating the patients with sleep disordered breathing (SDB). To analyze the pharyngeal space in retroglossal region and in the region of hypopharynx at the level of epiglottis as well as it's relation with height and weight of the individuals.

Materials and Methods: The study was conducted among 60 participants age 21-50 years and were equally divided into snorers and non snorers. Lateral cephalogram was taken maintaining the exposure parameters and DIGORA software was used for soft tissue parameters. Two parameters analyzed were distance of posterior pharynx from tip of the epiglottis and distance of epiglottis from tip of soft palate. Height and weight of the patient were also calculated and body mass index (BMI) was calculated. Paired 't' test was used for statistical analysis.

Results: Retroglossal length was found to be more among snorers compared to non snorers and snorers were found to have direct co-relationship with height among snorers.

Conclusion: Pharyngeal space was found to be less at level of tip of epiglottis and found to have a positive relationship with the weight of the study participants.

Keywords: Snoring, lateral cephalogram, epiglottis, pharynx, epiglottis closure, sleep endoscopy.

INTRODUCTION

Snoring which falls within the spectrum of sleep-related breathing disorders considered to be common symptom of airway obstruction. Snorers can also be divided into occasional snorers and habitual snorers (who snore always every night. Snoring in the pediatric population is increasing and has been identified as a primary health concern by the American Academy of Pediatrics. This increase has been associated with a rise in co-morbid disease processes such as asthma and allergies, lifestyle changes and increasing changes and increasing obesity in the pediatric population. Sleep-disordered breathing (SDB) is a collective clinical term encompassing primary snoring, upper airway resistance syndrome (UARS), and obstructive sleep apnea (OSA).[1] These syndromes currently are regarded to fall along a spectrum of severity concerning the same pathophysiological condition which is caused by vibrating tissues accompanied by increased collapsibility and incomplete

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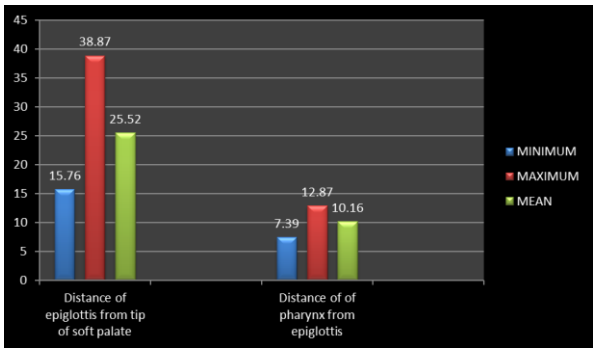
pharyngeal obstruction or narrowing of the pharyngeal airway.[2] Snoring is suspected to be associated with sleep apnea syndrome (SAS). In other words, snoring is an inevitable symptom of sleep apnea syndrome (SAS) has been shown to associated with hypertension and angina pectoris. [3]

Table 1: Showing mean, standard deviation and p value associated with the parameters.

PARAMETER	GROUP	N	MEAN	STD DEVIATION	t value	P value
Distance of epiglottis from soft palate	Snorer Non snorer	30 30	25.52 23.70	5.34 5.05	1.35	.179
Distance of pharynx from epiglottis	Snorer Non snorer	30 30	8.54 10.16	2.41 2.18	-2.73	.008



Graph 1: Bar graph showing maximum, minimum and mean values of above mentioned parameters among non snorers.

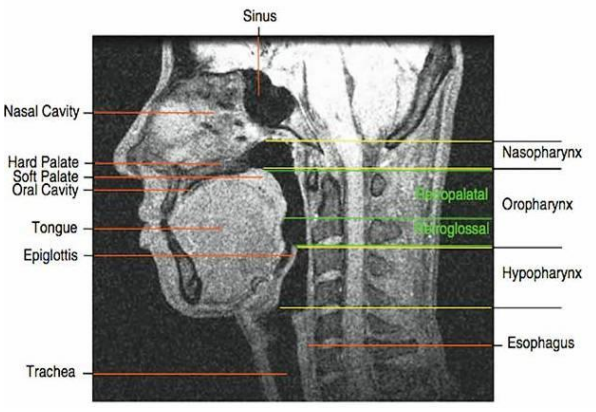


Fig 1: Diagram showing various parts of posterior pharyngeal space.

Over the years, lateral cephalometric radiography has become one of the standard diagnostic tools to evaluate skeletal and soft tissue abnormalities contributing to obstruction, and have been the most common imaging method in evaluating the patients with SDB. Radiograms of the head and neck with special focus on several bony and soft tissue landmarks are involved in this traditional method. Numerous 2D and 3D studies have been conducted on understanding the pharyngeal space (FIG 1) in the retropalatal region.[1]However few studies have been attempted to evaluate the airway space related to epiglottis. Therefore present study aims to analyze the pharyngeal space in retroglossal region and in the region of hypopharynx at the level of epiglottis as well as it's relation with height and weight of the individuals.

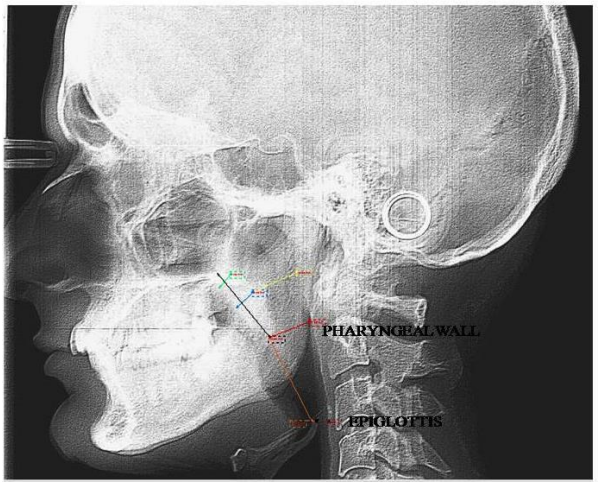


Fig 2: Black line represents length of soft palate, green line represents width of soft palate at junction, blue line represents maximum width of soft palate, yellow line represents distance to pharynx from maximum width, red line represents distance to pharynx from tip of soft palate, orange line denotes distance to epiglottis from tip of soft palate and brown line represents distance to pharynx from epiglottis.

MATERIALS AND METHODS

This cross sectional study was conducted in the Department of Oral Medicine & Radiology, Divya Jyoti College of Dental Sciences and Research. Study participants included the volunteers among the students and out patients of Divya Jyoti College of Dental Sciences and Research. Patients with known history of regular snoring with history of regular snoring revealed by the patient based on questionnaire and exclusion criteria were those individuals who could not give a written consent for exposure to X- rays, or those in whom X-ray exposure would be more riskier, patients with

history of injury or environmental factors known to cause craniofacial deformity, patients undergoing or previously undergone orthodontic/ orthognathic surgery, presence of gross facial asymmetry, history of surgical intervention involving craniofacial skeleton and soft tissue surgery of head and neck region, history and / or clinical features suggestive of endocrine disturbances, neuromuscular disorder, hereditary, nutritional or developmental or any prolong illness affecting oropharynx.. Among these only 60 individuals in age range of 21-50 years were selected for completing the study based on inclusion and exclusion criteria. These 60 individuals were grouped into snorers and non snorers based on their answers for the study questionnaire related to snoring. All the exposures were made at 75kvp, 10mAs using scanography technique. A second radiograph was made to produce to optimum images of soft tissues and hard tissues with necessary correction in exposure parameters. Radiographs with optimum contrast and less noice were considered for study. All images were stored digitally and the image quality was optimized separately for soft tissue and hard tissue landmarks using the inbuilt software (DIGORA FOR WINDOWS). A master chart including all the measurements of various linear measurements are made using Microsoft excel 2007 (Microsoft corp. ltd) and for statistical analysis paired 't ' test for inter group study and One way annova and Post Hoc Tests were done for intra group study. Height and weight of the patients were also measured and were co-related with the parameters analyzed and resultant BODY MASS INDEX (BMI) was calculated.

The data was analyzed using Microsoft excel 2007 and statistical procedure social services (SPSS 16.0) statistical software programme.

PARAMETERS ANALYZED ON LATERAL CEPHALOGRAM (FIGURE 2)

1. DISTANCE BETWEEN POSTERIOR WALL OF PHARYNX FROM TIP OF THE EPIGLOTTIS

2. DISTANCE BETWEEN POSTERIOR WALL OF PHARYNX FROM EPIGLOTTIS

RESULTS

DISTANCE OF EPIGLOTTIS FROM TIP OF SOFT PALATE

Among snorers minimum and maximum distance was 13.92 mm and 38.87 mm respectively with a mean of 25.52 mm whereas among non snorers minimum and maximum values was 15.76 mm and 38.64 mm respectively with a mean value of 23.70 mm The above observations revealed that the retroglossal length to be slightly more (mean= + 1.82 mm) among snorers as compared to non snorers. Distance of epiglottis from tip of soft palate was compared with height

of the individual to analyze their co-relationship and was found that out of 30 study group participants, the distance of epiglottis from tip of soft palate was in direct co-relationship with height of 23 individuals. For control group individuals the distance to pharynx from epiglottis was varying without any correlationship. The above values were subjected to paired 't' test and was found to be statistically non significant (p >.05) .

DISTANCE BETWEEN POSTERIOR WALL OF PHARYNX FROM EPIGLOTTIS: Among snorers minimum and maximum distance was 5.53 mm and 17.61 mm respectively with a mean of 8.54 mm whereas among non snorers minimum and maximum values was 7.39 mm and 12.87 mm respectively with a mean value of 10.16 mm. The above observations revealed that the distance to pharynx from epiglottis to be less (- 1.62 mm) among snorers as compared to non snorers. The distance of pharynx from epiglottis was compared with the obesity of the study participants to analyze their co-relationship and was found that out of 60 individuals, the distance of pharynx from epiglottis was in direct co-relationship with obesity of 37 individuals. In rest of 23 individuals, distance was varying without any correlationship. The above values were subjected to paired 't' test and was found to be statistically significant (p<.05).

DISCUSSION

Snoring and OSAS is a potentially serious disorder affecting millions of people has been attributed to nasal obstruction such as nasal polyps, deviated nasal septum, hypertonic inferior turbinates and oropharyngeal obstruction where in soft palate, tonsils and pharynx showing common sites of

obstruction. Surgical treatment Uvulopalatopharyngoplasty (UPPP), initially

described by Fujita & colleagues, is used to correct obstruction at the oropharyngeal level by modification of the uvula, removal of redundant pharyngeal and palatal tissue, and primary closure of the posterior and anterior pillars to enlarge the retropalatal airway.[4,5] **QUINN ET AL** performed sleep nasoendoscopy on 54 adult snorers in whom obstructive sleep apnoea had been excluded by an overnight sleep study. This was successfully achieved in 50 of the 54 snorers. Thirty-five out of 50 (70%) had palatal flutter snoring only. In a further 20%, palatal flutter snoring was combined with evidence of noise generation at another site. The second site was supraglottic in l0%, tonsillar in 8% and tongue base in 2%. The tongue base was also the sole site of noise generation in 8% and the epiglottis was the sole site in 2%. [6]. Present study reveals that the mean difference in the pharyngeal space among snorers and non snorers which was statistically significant was found to be 1.62mm in the level of epiglottis. A study by **HORNER ET AL** revealed with the help of magnetic resonance imaging large deposits of fat in postero - lateral to oropharyngeal airspace at the level of soft palate and a linear co-relation is suggested between obesity and obstructive sleep apnea patients where fat deposits are responsible for narrowing of upper respiratory tract.[7,8] In our study it is seen that there is a positive co-relationship of weight with snoring with respect to pharyngeal space in the level of epiglottis in 62% of the study participants. Study conducted by **AZARBARZIN ET AL** conducted a study on 23 OSA patients who underwent sleep endoscopy and total of 1232 breaths were scored as epiglottic/non-epiglottic collapse and revealed that epiglottic collapse was characterized by a rapid fall(s) in the inspiratory flow, more variable inspiratory and expiratory flow, and reduced tidal volume. The cross-validated accuracy was 84%. They showed that a characteristic antero-posterior movement of epiglottis produced a sharp and severe reduction in airflow and the epiglottis was observed to be an unstable structure that would sometimes reopen/close repeatedly during inspiration causing a “jagged” flow. In addition to producing unique flow features, epiglottic collapse may also generate characteristic sounds that may be different than the non-epiglottic snoring sounds.[9] Surgical intervention i.e ‘ epiglottis stiffening operation (ESO)’ has been successfully employed to treat epiglottis collapse in OSAS patients.[10] Previous studies have also argued that posterior movement of the tongue could cause the epiglottis to collapse.[11] Therefore present study was also conducted to observe the linear measurement changes in the retroglossal region among the snorers and it was seen that retroglossal length to be slightly more (mean= + 1.82 mm) among snorers as compared to non snorers which can be analyzed more posterior surface area of tongue is available leading the tongue to fall back and causing epiglottis collapse. A CBCT study **BUCHANAN ET AL** also had similar observations where they have shown that OSA subjects had a significantly smaller average airway area, average airway volume, total airway volume, and mean airway width. OSA subjects had a significantly larger airway length measurement.[12] Very few studies have been conducted on analyzing the pharyngeal space with respect to epiglottis and it’s related structure. This study with help of lateral cephalogram which is easily available, cost effective and providing an easy understanding of the diagnosis of the snoring owing the pharyngeal obstruction at the level of epiglottis.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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