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CEPHALOMETRIC COMPARISON OF OBSTRUCTIVE SLEEP APNEA PATIENTS AND HEALTHY CONTROLS

Dr. Mudasir Khan[1], Dr. Nazia Lone[2] and Dr. Ifzah Usman*[3]

[1]Consultant, Govt District Hospital Anantnag, Srinagar.
[2]Associate Professor and Head, Department of Pedodontics and Preventive Dentistry, Govt Dental College, Srinagar.
[3]Registrar Department of Pedodontics and Preventive Dentistry Govt Dental College and Hospital Srinagar.

***Corresponding Author: Dr. Ifzah Usman**

Registrar Department of Pedodontics and Preventive Dentistry Govt Dental College and Hospital Srinagar.

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ABSTRACT

Obstructive sleep apnea (OSA) is a condition which induces an unnatural and unusual increase in upper-airway resistance. Lateral cephalography is a useful tool to evaluate skeletal and soft tissue characteristics of patients with OSA. This study was undertaken to compare the cephalometric characteristics of OSA patients with healthy subjects and determine possible relationships between cephalometric measurements of OSA patients and control subjects. METHOD: 18 OSA patients (10 men and 8 women) with age range from 20 to 55 years and 18 healthy subjects (10 men and 8 women) with age range from 30 to 57 years were selected for this study. Standardized lateral cephalometric radiographs were taken for patients in both the groups. RESULTS: SNA, SNB, and mandibular plane angles (Go-Gn-SN), anterior and posterior facial heights, and postero-anterior face height ratio were similar in both groups (P>.05). The distance between the hyoid and mandible was significantly greater in the OSA group than in the control group. DISCUSSION: In OSA patients, the hyoid bone was more inferiorly placed. OSA patients had reduced midface length which may cause a reduction of space available for the airway. The choice for the cephalometric analysis used in this study was due to its large use in radiological and orthodontic clinics and for it embraces measures in all regions susceptible to obstruction.

KEYWORDS: Cephalography, postero-anterior.

INTRODUCTION

Obstructive sleep apnea is a condition which induces an unnatural and unusual increase in upper-airway resistance. Frequent episodes of airway obstruction associated with a reduced diameter of the upper airway, which is vulnerable to further narrowing and collapse characterize OSA.[1,2]

Narrow airway space, relative mandibular retrognathia, increased tongue volume, and enlargement of palatine or adenoidal tissue are some of the causes of OSA. Severity of OSA may be assessed subjectively by the patient or his/her spouse and objectively by nocturnal polysomnography or imaging techniques. However, polysomnography has the disadvantage of being time consuming and complicated.[3,4,5]

Lateral cephalography is a useful tool to evaluate skeletal and soft tissue characteristics of patients with OSA. This study was undertaken to compare the cephalometric characteristics of OSA patients with healthy subjects and determine possible relationships between cephalometric measurements of OSA patients and control subjects.

MATERIALS AND METHODS

18 OSA patients (10 men and 8 women) with age range from 20 to 55 years and 18 healthy subjects (10 men and 8 women) with age range from 30 to 57 years were selected for this study. Polysomnographic examination was used to diagnose individuals with OSA. Prior to the study informed consent was obtained from all the patients and standardized lateral cephalograms of the patients with OSA and patients in control group were obtained from the same dental radiographic unit. Patients with temporomandibular disorders and severe periodontitis were excluded from the study. Cephalometric landmarks were marked and traced. This cephalometric analysis constituted of 28 points forming 14 factors (linear measures).

STATISTICAL METHOD

The results of both readings were compared through Student's t test with level of significance at 5% (α = 0.05). The mean for every factor obtained on the control group was compared to the standard value of the Sleep Apnea analysis through the test.

RESULTS

Radiographs of the OSA patients and control group subjects showed very similar facial characteristics. Midface length was significantly shorter and upper lip E-plane length was significantly longer in the OSA group than in the control group (P<.05). SNA, SNB, and mandibular plane angles (Go-Gn-SN), anterior and posterior facial heights, and postero-anterior face height ratio were similar in both groups (P>.05). Maxillary length was slightly longer in the OSA group, whereas the mandibular length was found to be slightly increased in the control group (P<.05). Dental examination showed that there were no differences between the position of the teeth in the OSA and control groups. The distance between the hyoid and mandible was significantly greater in the OSA group than in the control group.

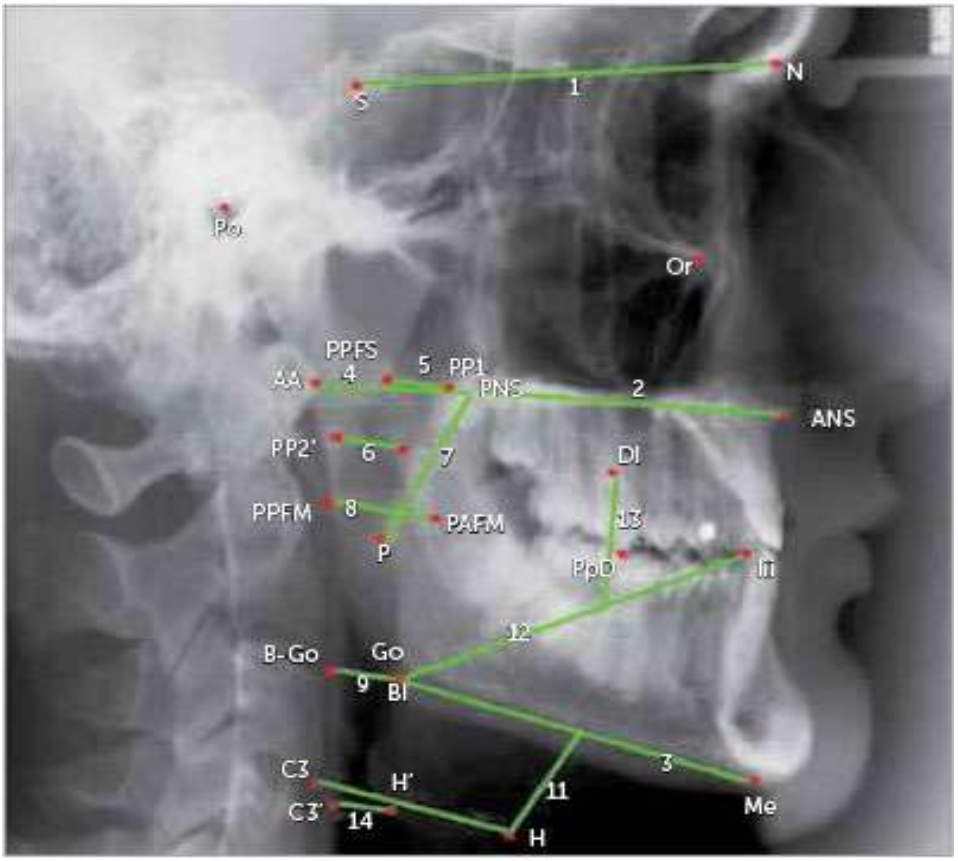

Figure 1 - Representation of points and factors evaluated on Sleep Apnea cephalometric analysis.

Mean, standard deviation and p value of the 14 linear measures (mm) on the control group and standard values after application of student-t test in females.

S. No.	Factor	Control Group Mean ± S.D	Standard values Mean ± S.D.	p value
1	S-N	69.70 ± 3.11	73 ± 3.00	0.2858
2	ANS-PNS	74±3.45	85±3.56	0.7964
3	Goc-Me	56±5.00	39±6.57	0.9883
4	AA-PNS	79±2.56	27±8.97	0.2885
5	PPFS-PP1	19±7.20	12±3.78	0.2780
6	PP2-PP2	14±1.22	37±4.09	0.9618
7	PNS-P	34±2.65	22±6.87	0.6703
8	PPFM-PAFM	93±2.04	15.2±3.50	0.3684
9	B-GO/BI	40±9.00	45±3.45	0.6652
10	C3-H	19±7.88	14±3.00	0.6980
11	PM-H	73±4.44	79±5.00	0.4302
12	BI-PI	24±4.80	29.5 ± 3.00	0.1809
13	DI-PI/BI	16±3.56	17.5 ± 4.00	0.2367
14	C3-H	19±5.77	16.7±4.33	0.867

Mean, standard deviation and p value of the 14 linear measures (mm) on the control group and standard values for male individuals after application of student –t test.

S. No.	Factor	Control Group Mean ± S.D	Standard values Mean ± S.D.	p value
1	S-N	76.10±4.54	56±2.34	0.3056
2	ANS-PNS	60.02±4.97	84±4.56	0.1758
3	Goc-Me	76.45±4.56	36±6.54	0.1367
4	AA-PNS	19.90±2.11	26±9.80	0.4892
5	PPFS-PP1	23.45±7.45	12±3.2	0.5769
6	PP2-PP2’	34.68±3.75	34±5.00	0.3451
7	PNS-P	19.71±2.34	22±4.50	0.5761
8	PPFM-PAFM	14.45±3.26	15.5±3.50	0.7749
9	B-GO/BI	40.81±4.29	41±3.54	0.6324
10	C3-H	19.76±4.80	19.6±6.00	0.9614
11	PM-H	73.39±4.88	79±5.00	0.2819
12	DI-PI/BI	24.38±3.56	29.5±3.00	0.1237
13	BI/PI	23±2.31	45±2.11	0.2314
14	C3’-H’	16.85±5.67	17.45±4.00	0.8565

DISCUSSION

The aim of this investigation was to evaluate the craniofacial morphology of patients with and without obstructive sleep apnea. In OSA patients, the hyoid bone was more inferiorly placed. Lower position of the hyoid with a lower tongue posture may increase the mandibular load because of the requirement of extra energy to elevate the tongue; this, in turn, may aggravate apnea by resulting in the open-mouth posture during sleep. In the present study, the airways tended to be smaller in the OSA patients than in the control group; however, this difference was insignificant in the upper and lower airway spaces.[6] Enciso et al found significantly smaller lateral dimension in OSA patients, however they found no significant differences in mean airway length, average cross-sectional airway and total volume of the airways.[7] OSA patients had reduced midface length which may cause a reduction of space available for the airway.[8]

The choice for the cephalometric analysis used in this study was due to its large use in radiological and orthodontic clinics and for it embraces measures in all regions susceptible to obstruction.

The hypothesis that anatomic factors are involved on the etiology of obstructive sleep apnea is a great support in literature. Therefore, it is important to know the anatomic alterations predominant in apneic individuals so that professionals that work directly with lateral cephalometric radiographs can identify risk factors and refer the patient to specialists and specific examinations such as polysomnography can be done for diagnosis of obstructive sleep apnea. This will contribute to the early diagnosis of the disease, avoiding the severe sequelae related to it.

CONCLUSION

Craniofacial measurements can be used as reference on the diagnosis of Obstructive sleep apnea.

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