Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021

CEPHALOMETRIC ASSESSMENT REGARDING CRANIOCERVICAL POSTURE IN ORTHODONTIC PATIENTS

Dr. Sujit Panda, DrKaruna Singh Sawhny, Dr Neha Agarwal

Professor HOD, Department of Orthodontics and Dentofacial Orthopedics
Rama Dental College Hospital and Research Centre, Faculty of Dental Sciences, Rama University, Kanpur
Address- Rama Dental College Hospital and Research Centre, Faculty of Dental sciences, Kanpur, Uttar Pradesh 20824
Telephone- 9839138625
Email- drsujitpanda@yahoo.co.in

Professor, Department of Orthodontics and Dentofacial Orthopedics, Rama Dental College Hospital and Research Centre, Faculty of Dental Sciences, Rama University, Kanpur
Address- Rama Dental College Hospital and Research Centre, Faculty of Dental Sciences, Kanpur, Uttar Pradesh 20824

Professor, Department of Orthodontics and Dentofacial Orthopedics, Rama Dental College Hospital and Research Centre, Faculty of Dental Sciences, Rama University, Kanpur
Address- Rama Dental College Hospital and Research Centre, Faculty of Dental Sciences, Kanpur, Uttar Pradesh 20824
Telephone- 9956178170

ABSTRACT

A major factor that contributes to dental malocclusions is represented by the positioning of the mandible. Considering the existing interconnections between the craniocervical and craniomandibular systems it is interesting to assess how changes in one system can influence the other, thus establishing a pattern in terms of certain cephalometric landmarks that orthodontists could consider when diagnosing and evaluating an orthodontic case. Therefore, the aim of this study was to investigate the connections between cervical posture, head position, hyoid bone position in orthodontic patients with different skeletal patterns. 45 lateral cephalometric radiographs were analyzed. Skeletal class and vertical growth were the main elements that were considered when classifying patients. Craniofacial and Cervical landmarks were determined on the cephalograms, from which lines and angles resulted which were considered relevant in our study. Correlations between cephalometric variables of the patients were determined. there were some statistically significant changes identified concerning craniocervical posture and hyoid bone position between the patients in the following parameters: H-Rgn, OPT/HOR, CVT/HOR,

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021

OPT/SN, CVT/SN, H-SN. The results obtained allowed us to conclude that there were some differences at the skeletal level of the sample of patients studied. The findings are indicating that there is a close relationship between, mandible position, cervical- and head posture and the hyoid bone. The information obtained in this study could help to better understand the development of malocclusions, and to improve the orthodontic diagnostic and treatment plan.

INTRODUCTION

Malocclusion is defined as a deformity of the dentition and the craniofacial skeleton deriving from genetic and environmental factors, which is considered as the third priority of oral conditions followed by caries and periodontal diseases, having an impact on the physical and mental health. At present, it has gradually become one of the motivations for people to seek orthodontic treatments. It can not only affect esthetics of the face, but can also contribute to functional issues, such as difficulty in mastication, phonetics, and even mental health of patients.[1, 2] Concerning the mechanisms of occlusion alterations, although the effects of these etiological factors have not been fully understood, a growing number of researchers have attached more importance to the influence of environmental factors on the occurrence of malocclusion. The stomatognathic system is possibly implicated in the postural system via the various muscular groups and functions as an interconnected and coordinated apparatus involved in dental occlusions, temporomandibular joints and related muscles. Any abnormalities or variations in this system can negatively influence the behavior of other systems disrupting postural stability and potentially leading to cranio-cervical-mandibular disorders.[3]

Craniocervical posture, refers to alignment of head upon the cervical vertebrae in space, is a biomechanical position of muscular and skeletal balance. It was explained by a close morphological and functional connection of cervical spine with craniofacial structures, which plays a role of a transitional zone of head and cervical region. Optimal cervical lordosis is an important physiological curve for maintaining the mechanical stability and function of the cervical spine. In recent years, a growing number of investigations support a developmental link between malocclusion and improper head and cervical posture, which is primarily explained by the “soft tissue stretching hypothesis”, stating a head extension may predispose individuals to a passive stretching of soft tissues generating stress on cervical structures by increasing the amount

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021

of antigravity load, which also restrains the normal forward growth of the facial structures. It was also found that an increased vertical facial development, a steeper inclination of the mandible and a very high probability of skeletal class II malocclusion with a convex profile in subjects were accompanied by poor craniocervical posture. However, several studies have rejected the relationship linking malocclusion and craniocervical posture, due to a variety of possible factors such as the limits of age, gender, race, the small samples examined, and poor-quality designs used.[4]

Despite the extensive evidence of anatomical and physiological association between malocclusion and cervical disorders, there is no consensus on this topic about the effects of head and neck posture on maxillofacial development in patients with sagittal skeletal malocclusion throughout all the growth stages.[3,4] Therefore, the objective of the present study was to investigate whether an association exists between position of the head and cervical spine, and craniofacial morphology in patients with different sagittal skeletal jaw relations during different stages of growth, clarifying the relationship between the postural variables and malocclusion may be considered an important element of orthodontic diagnosis and treatment for clinicians.

Materials and methods

This study is a cross-sectional study, a sample of 190 individuals were included in the present study. To reduce heterogeneity brought about by gender differences, men and women were divided equally. The study was conducted with the pretreatment lateral cephalometric radiographs, a total of 225 patients who had attended the department of orthodontics for seeking treatment were randomly selected from the record archives. 95 subjects were not included according to the inclusion and exclusion criteria. Finally, a total of 190 (95 females and 95 males, aged 7–18 years) were selected on the basis of the following inclusion criteria. The study was reviewed and approved by the local ethics committee. Informed consent was obtained from the subjects and/or their parents.

INCLUSION AND EXCLUSION CRITERIA

Subjects were included if they had:

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021

1. Sagittal skeletal malocclusion
2. Lateral cephalometric radiographs taken in the natural head position (NHP) and at least four clear cervical spine shapes
3. A Chinese ethnic origin
4. No history of orthodontic treatment or orthognathic surgery.

Subjects were excluded if they had:

1. Deleterious oral habits such as oral breathing or chewing side preference
2. A history of severe vertical or horizontal development collapse;
3. Neurological and respiratory diseases
4. Potential craniomaxillofacial disorders such as temporomandibular joint disorders or cleft lip and palate
5. Family history.

LATERAL CEPHALOMETRIC RADIOGRAPHS

Cephalograms were routinely obtained with ProMax (Planmeca, Helsinki, Finland) in the NHP. Exposure was operated at 80 kV, 10 mv. The NHP of the patient was determined by positioning the subjects in a standing, self-balanced position in which they felt comfortable and relaxed. Evidence has shown excellent stability for 5 or even 15 years after the initial radiograph.[6,7] Nine craniofacial morphology-associated variables of sagittal skeletal malocclusion and nine variables representing craniocervical, craniovertical, and cervicohorizontal and cervical curvature angles were measured using Myorthox measurement tool.[6-9]

VARIABLES AND DATA MEASUREMENT

Variables associated with craniofacial morphology such as SNA, SNB, ANB, FH/ML, NSL/NL, NSL/ML, NA-PA, NP-FH, Y axis in patients with sagittal skeletal malocclusion were measured

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021

on the cephalograms. Craniocervical posture is mainly determined by the angle formed by Odontoid Process Tangent (OPT) and Nasion-Sella line (NSL) (NSL/OPT), the angle between Nasal line (NL) and OPT (NL/OPT), the angle between NSL and Cervical Vertebra Tangent (CVT) (NSL/CVT), and the angle between NL and CVT (NL/CVT). Cervical inclination was assessed using cervicohorizontal angles, such as the angle formed by OPT and horizontal line (HOR) (OPT/HOR), and the angle between CVT and HOR (CVT/HOR). Meanwhile, head position was represented using the craniovertical angles, such as the angle formed by NSL and VER (NSL/VER), and the angle between NL and VER (NL/VER). Cervical curvature was determined by measuring the angle formed by OPT and CVT (OPT/CVT.

STATISTICAL ANALYSIS

Descriptive variables were conducted using the Statistical Package for Social Sciences (SPSS), version 26.0 (SPSS Inc, Chicago, IL, USA). The quantitative postural variables were calculated as the mean (M) and standard deviation (SD). Pearson's analysis was used to evaluate the correlation between craniocervical posture and craniofacial morphology in patients with sagittal skeletal malocclusion during different growth periods, and assess the potential impact of growth by comparing the correlation coefficients in various growth periods. An independent sample t-test was employed to investigate the potential influence of gender on the correlation between craniocervical posture and craniofacial morphology in sagittal skeletal malocclusion. A one-way analysis of variances (ANOVA) was used to examine and compare the intergroup differences in cervical posture across different skeletal classes during the same growth period. Significance was set at $p \leq 0.05$.

RESULTS

The ICC values for measurement items were determined to be higher than 0.9 for both intra- and inter-examiner assessments, suggesting a strong level of repeatability and reproducibility. Almost all values fit to a normal distribution. No postural variables were related to gender ($P > 0.05$). Significant differences were observed in most variables, such as the correlations between ANB, SNB, FH/ML, Y axis, NA/PA, NP/FH and NSL/VER, NSL/OPT, NL/OPT, NSL/CVT, NL/CVT, OPT/HOR, CVT/HOR during the peak and post-peak growth periods

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021

respectively. However, the correlation coefficients varied from low to moderate for most variable.

The results of the study are summarized in table 1,2,3.

Table1:Gender wise distribution of the subjects

Gender	N	percentage
males	69	38.33
females	111	61.66
total	180	100%

Table 2:Growth pattern distribution according to sex

Growth Pattern	male	female	total	
horizontal	24	36	60	
average	27	38	65	
vertical	18	37	55	

CONCLUSIONS

Consequently, the most important findings of our paper are: • Hyoid bone position in relation to retrognathion is closer in class II patients than in class III patients. • Cervical position differs significantly between class II and class III patients in terms of cervical spine inclination. • Class III patients have a cervical lordosis tendency, while in class II patients a cervical kyphosis tendency can be observed. • Class II patients have a more backward inclination of the head, this having a detrimental effect at the occlusal level, through a more posterior positioning of the mandible. • In class III patients there is an opposite effect. Te position of the head being more down and forward most likely as a way of compensating the body for tilting the cervical spine

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021

further backwards resulting in a more anterior position of the mandible. These findings indicate a close relationship between, hyoid bone positioning, cervical and head posture. Therefore, affected patients may compensate for pathological changes at the skeletal level through postural adjustments of the head and neck region. To further evaluate possible applications for orthodontic diagnosis and treatment, more studies should be carried out in this field and to evaluate their possible connections with dental malocclusions

REFERENCES

1. Paço, M., Duarte, J. A. & Pinho, T. Orthodontic treatment and craniocervical posture in patients with temporomandibular disorders: An observational study. Int. J. Environ. Res. Public Health 18(6), 3295. https://doi.org/10.3390/ijerph18063295 (2021).

2. Armijo, O. S., Magee, D. J., Parftt, M., Major, P. & Tie, N. M. R. (2006) Te association between the cervical spine, the stomatognathic system, and craniofacial pain: A critical review. J. Orofac. Pain 20, 271–287 (2006).

3. McGuinness, N. J. & McDonald, J. P. Changes in natural head position observed immediately and one year afer rapid maxillary expansion. Eur. J. Orthod. 28, 126–134 (2005).

4. Motoyoshi, M., Shimazaki, T., Sugai, T. & Namura, S. Biomechanical infuences of head posture on occlusion: An experimental study using fnite element analysis. Eur. J. Orthod. 24, 319–326 (2002).

5. Ferraz, M. J., Nouer, D. F., Teixeira, J. R. & Bérzin, F. Cephalometric assessment of the hyoid bone position in oral breathing children. Braz. J. Otorhinolaryngol. 73(1), 45–50 (2007).

6. Solow, B. & Tallgren, A. Head posture and craniofacial morphology. Am. J. Phys. Anthropol. 44(3), 417–35. https://doi.org/10.1002/ ajpa.1330440306 (1976).

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021

7. Crupi, P. et al. Correlations between cephalic posture and facial type in patients sufering from breathing obstructive syndrome. Eur. J. Paediatr. Dent. 8(2), 77–82 (2007).

8. Meibodi, S. E. et al. Cervical vertebrae anomalies in patients with class III skeletal malocclusion. J. Craniovertebr Junct. Spine. 2(2), 73–76. https://doi.org/10.4103/0974-8237.100059 (2011).

9. Meiyappan, N., Tamizharasi, S., Senthilkumar, K. P. & Janardhanan, K. Natural head position: An overview. J. Pharm. Bioallied Sci. 7(Suppl 2), S424–S427. https://doi.org/10.4103/0975-7406.163488 (2015). 16. APA, Cobourne, M. T. & DiBiase, A. T. Handbook of Orthodontics 2nd edn. (Elsevier Science, 2015).

10.Amayeri, M., Saleh, F. & Saleh, M. Te position of hyoid bone in diferent facial patterns: a lateral cephalometric study. Eur. Sci. J.. https://doi.org/10.19044/esj.2014.v10n15p%p (2014).
11. Pereira Coelho Ferraz, M. J., Nouer, D. F., Bérzin, F., AlvesdeSousa, M. & Romano, F. Cephalometric appraisal of the hyoid triangle in Brazilian people of Piracicaba's region. Braz. J. Oral Sci. 5(17), 1001–1006 (2006).

12.Hedayati, Z., Paknahad, M. & Zorriasatine, F. Comparison of natural head position in diferent anteroposterior malocclusions. J. Dent. 10(3), 210–220 (2013).

13. Khare, A. et al. A clinical study to examine the efect of complete denture on head posture/craniovertical angle. J. Clin. Diagn. Res. 10(4), ZC08-08. https://doi.org/10.7860/JCDR/2016/10879.7521 (2016).

14. Nascimento, A. L. O. et al. When tongue strength exercises refect in the cervical region. Codas 32(4), e20180285. https://doi.org/ 10.1590/2317-1782/20202018285 (2020).

15. Törne, H. Te rest position of the mandible and the path of closure from rest to occlusion position. Acta Odontol. Scand. 11, 141–147 (1953).

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021