Journal of Oral Science, Vol. 46, No. 1, 15-18, 2004

Original

Investigation of natural head posture in different head types

Mehmet Okan Akçam and Ayşegül Köklü

Department of Orthodontics, Faculty of Dentistry, Ankara University, Ankara, Turkey

(Received 27 June and accepted 3 December 2003)

Abstract: The aim of this study was to investigate natural head posture (NHP) in different head types. Lateral cephalograms of 99 adults (Mean age, 21.8 years ± SD, 2.2 yrs, range between 19 and 29 yrs) were examined. Head types were determined as Hyperbrachycephal, Brachycephal, Mesocephal or Dolichocephal according to the cephalic index. Analysis of variance and the Duncan's test were performed to assess inter-group differences for the parameters. The findings revealed that, NHP was statistically not different between the head type groups. Thus, it was suggested that environmental factors during growth may alter NHP, as well as craniofacial morphology but in a different manner (i.e. degree and direction) in each head type. (J Oral Sci. 46, 15-18, 2004)

Key words: natural head posture; head type.

Introduction

Natural head posture (NHP) has an influence on craniofacial development, as well as dental occlusion (1-22). Postural changes also have an influence on facial skeletal morphology, and cranial base angulation which affect NHP (23-25). The soft tissue stretching hypothesis was introduced by Solow and Kreiborg in 1977 to describe the interaction between NHP and craniofacial morphology considering nasopharyngeal airway dimensions(9). According to this hypothesis, altered nasorespirational function affects NHP and therefore the craniofacial configuration. In the literature, interrelations between NHP and craniofacial morphology have been widely shown (10-22). On the other hand, it is well known that head posture can be affected by functions like hearing, sight, equilibrium and even psychological condition, in addition to nasorespirational function. Natural muscle balance, the head posture which holds the head on the cervical column, is dependent on the head and cranial base dimensions and center of gravity of the head. Consequently, it is still unclear if the NHP is related to head dimensions, (i.e. head types). This question was addressed in the current study.

Correspondence to Dr. M. Okan Akçam, Ankara Üniversitesi, Diş Hekimliği Fakültesi, Ortodonti AD, Beşevler, Ankara 06500, Turkey
Tel: +90-312-212-2708
Fax: +90-312-213-0960
E-mail: akcam@dentistry.ankara.edu.tr

Materials and Methods

Subjects

Lateral cephalometric X-rays were taken at NHP position of 99 dental school students with an age range of 19 and 29 (Mean age 21.8 yrs, SD 2.2 yrs). Subjects were divided into four groups according to their head types; Hyperbrachy, Brachy, Meso and Dolichocephal which were determined by using the cephalic index (maximum head length / width × 100) classification (Fig. 1 and 2).

Cephalometric landmarks (Fig. 3) were drawn with a 0.3 mm soft pencil on 0.003 inch frosted acetate and then double digitized (Genius New Sketch Digitizer), measurements were calculated using the PorDios (Purpose on request digitizer input output system, Copenhagen, Denmark) computer program.

Statistical Survey

1. Repeatability coefficients were used to test the accuracy of locating the cephalometric reference points. A total of 25 cephalograms of randomly selected subjects were traced, double digitized and analyzed twice within an interval of one week.
2. Analysis of variance (ANOVA) and the Duncan's test were done to investigate inter-group differences of the parameters.

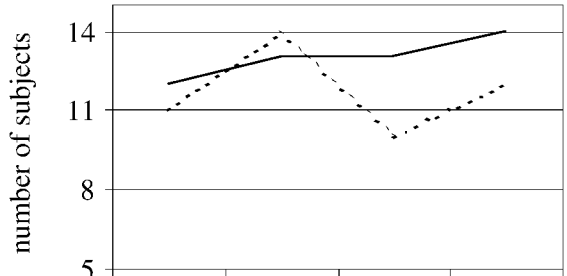
Results

Repeatability coefficients were high, indicating the reliability of the measurements, as reported in a previous study (17).

ANOVA and mean values with standard error of means of the parameters are shown in Table I. Parameters representing NHP were not distinctive between head types, thus, the Duncan test was not used since it is used to expose inter-group differences. The lowest OPT.CVT angle was recorded in the mesocephal group (1.56 ± 3.34) when compared to other head types.

Discussion

Reproducibility of NHP was tested by Özbek (19) and Memikoğlu (20) who found a consistency with the literature (14,16). Although head types and craniofacial structures are shown to be different in males and females (23), a statistical analysis of sex differences was not made because of the low number of subjects in our study. However, head types were almost equally distributed across sexes in each group (Fig. 1).



	HB	B	M	D
Male	12	13	13	14
Female	11	14	10	12

Fig. 1 Distribution of male and female subjects; hyperbrachy (HB), brachy (B), meso (M) and dolichocephal (D).

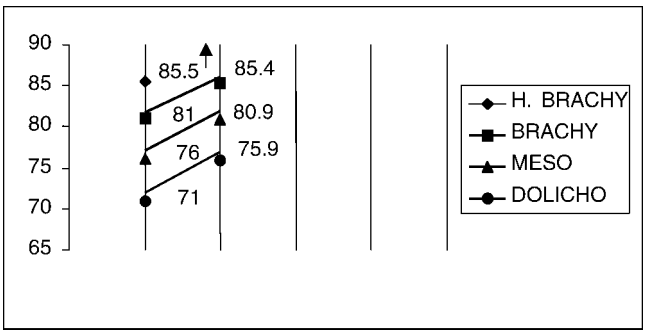


Fig. 2 Head type classification according to the maximum head length/width × 100 formula and the ranges of head types.

None of the postural parameters were found distinctive for a given head type. This finding appears to imply that craniofacial morphology is similar in different head types because of the similarity of NHP that is shown as one of the determinants of the craniofacial morphology (9-11,13-15,17-19,21,22,26). However, it was shown that the craniofacial characteristics are markedly distinctive between different head types (27). Therefore, it is believed that genetic and environmental factors contribute to the formation of craniofacial characteristics rather than the NHP. Changes that occur in the NHP may affect dento-skeletal morphology in a different manner in different head types, which is consistent with the findings of Sonnesen et al. (15).

Özbek and Erdem (28) investigated the relationship between vertical craniofacial morphology and airway capacity in subjects having vertical and average cervical

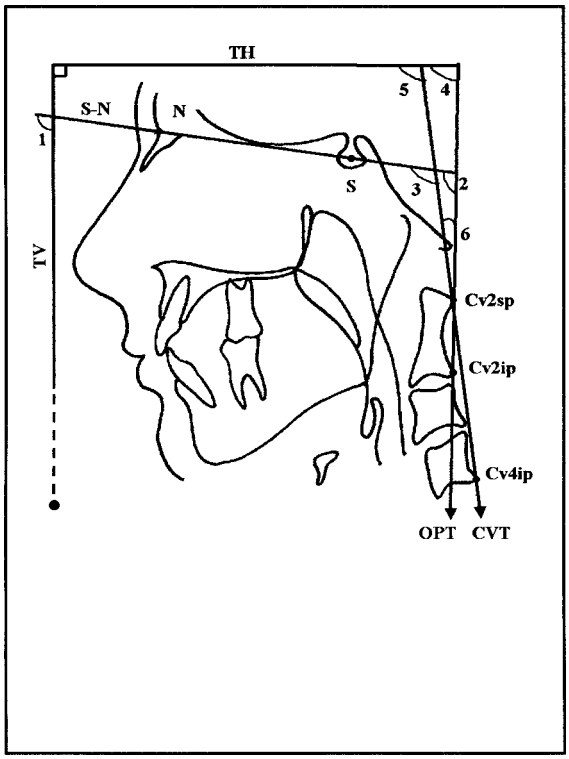


Fig. 3 Postural measurements. Reference points: *N;* nasion, *S;* sella, *Cv2sp;* supero-posterior point of 2nd vertebrae, *Cv2ip;* Infero-Posterior point of 2nd vertebrae, *Cv4ip;* infero-posterior point of 4th vertebrae. Postural angles: 1) SN.TV (true vertical; A lead chain hanged on cephalostat), 2) SN.OPT (OPT (odontoid process tangent); the reference line between Cv2sp and Cv2ip), 3) SN.CVT (CVT (cervial vertebrae tangent); the reference line between Cv2sp and Cv4ip), 4) OPT.TH (TH; true horizontal is the line perpendicular to TV), 5) CVT.TH, 6) OPT.CVT.

Table 1 Analysis of variance (ANOVA) and mean values with standard error of means of the postural parameters

Parameters	F	Hyperbrachy (n = 23)	Brachy (n = 27)	Meso (n = 23)	Dolicho (n = 26)
SN.TV (deg.)	NS	95.54 ± 0.91	96.29 ± 0.65	94.37 ± 1.02	96.7 ± 1.06
SN.OPT (deg.)	NS	97.30 ± 1.49	98.72 ± 1.11	96.14 ± 1.62	95.22 ± 1.72
SN.CVT (deg.)	NS	102.43 ± 1.42	103.28 ± 1.21	97.71 ± 3.08	100.66 ± 1.61
OPT.TH (deg.)	NS	91.76 ± 1.30	92.43 ± 1.02	91.76 ± 1.46	88.51 ± 1.36
CVT.TH (deg.)	NS	96.88 ± 1.25	96.99 ± 1.06	93.33 ± 2.64	93.96 ± 1.12
OPT.CVT (deg.)	NS	5.12 ± 0.69	4.56 ± 0.53	1.56 ± 3.34	5.44 ± 0.54

NS: not significant

posture and observed a low correlation between airway capacity and vertical craniofacial morphology in average cervical posture group while high correlations were observed in forward inclined and vertical cervical posture groups. They concluded that NHP was importantly related to the relationship between airway capacity and craniofacial morphology. Özbek and Erdem (29) also suggested that the relationship between airway capacity and craniofacial morphology should be evaluated in individuals having different cervical postures.

Conclusion

NHP has individual characteristics that depend upon the neurocranium and cranial base morphology. As the head dimensions vary remarkably, functional factors may not affect NHP similarly and may not cause the same craniofacial changes in different head types. There may exist a relationship between the cranial base dimensions, which is oriented regarding neurocranium morphology, and NHP for keeping the equilibrium of the head on the cervical column.

The findings revealed that NHP was not statistically different between the head type groups. Thus, it was suggested that environmental factors during growth may alter NHP, as well craniofacial morphology but in a different manner (i.e. quantity and direction) in each head type.

Acknowledgments

We wish to acknowledge and thank Professor Fikret Gürbüz (Department of Genetics and Statistics, Ankara University) for managing the statistical approach of this research.

References

1. Solow B, Kreiborg S (1977) Soft tissue stretching: a possible control factor in craniofacial morphogenesis. Scand J Dent Res 85, 505-507
2. Solow B, Tallgren A (1976) Head posture and craniofacial morphology. Am J Phys Anthrop 44, 417-436
3. Ceylan I (1990) Evaluation of natural head position and hyoid bone position in different ANB angles. Dissertation. Department of Orthodontics, Atatürk University, Erzurum, Turkey (abstract)
4. Cole SC (1988) Natural head position, posture and prognathism: the Chapman prize essay. Br J Orthod 15, 227-239
5. Erturk N, Doğan S, Aras A (1990) The Investigation the effects of natural head position and posture on the sagittal jaw relations. Turk J Orhodont 3, 1-6
6. Fjellvang H, Solow B (1986) Craniocervical postural relations and craniofacial morphology in 30 blind subjects. Am J Orthod Dentofacial Orthop 90, 327-334
7. Marcotte MR (1981) Head posture and dentofacial proportions. Angle Orthod 51, 208-213
8. Özbek MM, Köklü A (1993) Natural cervical inclination and craniofacial structure. Am J Orthod Dentofacial Orthop 104, 584-591
9. Solow B, Tallgren A (1977) Dentoalveoler morphology in relation to craniocervical posture. Angle Orthod 47, 157-164
10. Solow B, Siersbæk-Nielsen S, Greve E (1984) Airway adequacy, head posture and craniofacial morphology. Am J Orthod 86, 214-223

11. Solow B, Siersbæk-Nielsen S (1986) Growth Changes in head posture related to craniofacial development. Am J Orthod 89, 132-140
12. Solow B, Ovesen J, Nielsen PW, Wildschiødtz G, Tallgren A (1993) Head posture in obstructive sleep apnoea. Eur J Orthod 15, 107-114
13. Tallgren A, Solow B (1987) Hyoid bone position, facial morphology and head posture in adults. Eur J Orthod 9, 1-8
14. Wenzel A, Höjensgaard E, Henriksen JM (1985) Craniofacial morphology and head posture in children with asthma and perennial rhinitis. Eur J Orthod 7, 83-92
15. Sonnesen L, Bakke M, Solow B (2001) Temporomandibular disorders in relation to craniofacial dimensions, head posture and bite force in children selected for orthodontic treatment. Eur J Orthod 23, 179-192
16. Milani RS, DePeriere DD, Lapeyre L, Pourreyhon L (2000) Relationship between dental occlusion and posture. Cranio 18, 127-134
17. Akcam MO (1996) The evaluation of relations between craniofacial morphology, and nasopharngeal airway considering natural head posture. Dissertation. Department of Orthodontics, Ankara University, Ankara, Turkey (abstact)
18. Stramrund L (1959) External and internal cranial base. Acta Odont Scand 17, 239-266
19. Özbek MM (1990) Evaluation of the relations between natural head and neck posture and craniofacial morphology. Dissertation. Department of Orthodontics, Ankara University, Ankara, Turkey (abstract)
20. Memikoğlu TUT (1994) The evaluation of the craniofacial morphology in different head types regarding natural head and neck posture. Dissertation. Department of Orthodontics, Ankara University, Ankara, Turkey (abstract)
21. Vig PS, Showfety KJ, Phillips C (1980) Experimental manipulation of head posture. Am J Orthod 77, 258-268
22. Christie TE (1977) Cephalometric patterns of adults with normal occlusion. Angle Orthod 47, 128-135
23. Ingerslev CH, Solow B (1975) Sex differences in craniofacial morphology. Acta Odontol Scand 33, 85-94
24. Krzypow A B, Lieberman M A, Modan M (1974) Tooth, face and skull dimensions in different ethnic grups in Israel. Am J Orthod 65, 246-249
25. Wenzel A, Williams S, Ritzau M (1989) Changes in head posture and nasopharyngeal airway following surgical correction of mandibular prognathism. Eur J Orthod 11, 37-42
26. Akcam MO, Köklü A (2002) Natural head posture, nasopharyngeal airway and cranial base relations in different head types. Turk J Orthodont 15, 49-60
27. Bhat M, Enlow DH (1985) Facial variations related to headform type. Angle Orthod 55, 269-280
28. Özbek MM, Erdem D (1993) Relations between airway capacity and vertical craniofacial morphology in individuals having different cervical posture. Turk J Orthodont 6, 160-168
29. Özbek MM, Erdem D (1993) Evaluating the relations between airway capacity and vertical craniofacial morphology. Turk J Orthodont 6, 48-55