

Investigation of natural head posture in different head types

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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 \pm 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.

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 \times 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.

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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).

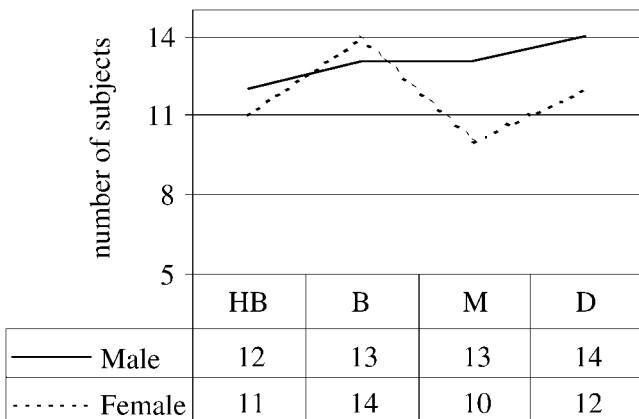


Fig. 1 Distribution of male and female subjects; hyperbrachy (HB), brachy (B), meso (M) and dolichocephal (D).

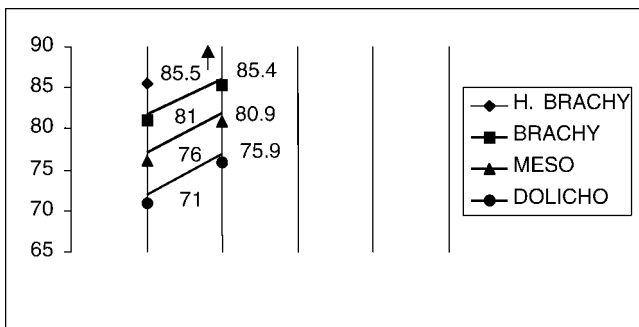


Fig. 2 Head type classification according to the maximum head length/width $\times 100$ formula and the ranges of head types.

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

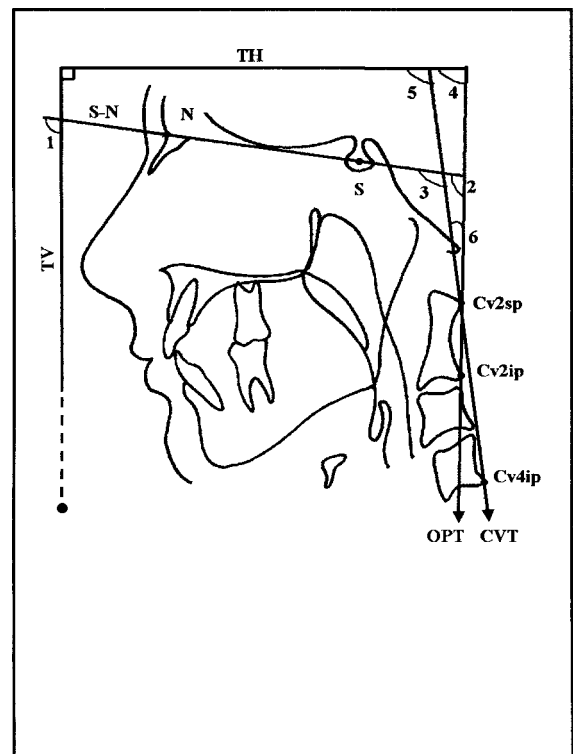


Fig. 3 Postural measurements. Reference points: N; nasion, S; sella, Cv2sp; supero-posterior point of 2nd vertebrae, Cv2ip; Infero-Posterior point of 2nd vertebrae, Cv4ip; infero-posterior point of 4th vertebrae. Postural angles: 1) SN.TV (true vertical; A lead chain hanged on cephalostat), 2) SN.OPT (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

<i>Parameters</i>	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.

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