Corrected head position

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Abstract

**Background:** Historically, many reference lines and planes of the human skull have been used in an attempt to depict the head in a natural head position (NHP) which is a relaxed/balanced position when looking ahead at their eye level. Head position correction has been attempted in fields such as anatomy, art, anthropology, orthodontics, oral and maxillofacial surgery, plastic surgery, and forensics. In orthodontics, oral and maxillofacial surgery, and plastic surgery, corrected head position (CHP) is particularly important for diagnosis of the normality/protrusion/retrusion of the patient’s facial skeleton. Usually a single plane, such as Frankfurt horizontal, is used to correct head position, but its angulation is variable between individuals, because each individual’s anatomy is unique. It has been found previously that the Neutral Horizontal Axis (NHA), Frankfurt horizontal (FH), Krogman-Walker plane (KW plane), and Palatal plane (P plane) demonstrated near parallelism, and these planes averaged -1 to -2 degrees from the true horizontal (HOR, which is a horizontal plane determined as being perpendicular to the earth’s gravitational force) with subjects in NHP.

**Methods:** Craniofacial planes were measured in an Aboriginal Australian sample and in two contemporary samples obtained from Australian orthodontic practices, and the findings were compared with previous studies. Each sample consisted of 40 individuals (20 males and 20 females) with subjects in NHP. The Aboriginal Australian sample was longitudinal (T1, mean age 10 years; T2, mean age 14 years, and T3, mean age 18 years) enabling NHP to be assessed over approximately 8 years. A soft tissue Ear - nose plane (EN plane) was also investigated.

**Results:** NHP reproducibility over 8 years demonstrated a mean of absolute difference of 2.9 degrees, with a range of differences from -7.9 to 8.2 degrees and a standard deviation of differences equal to 3.6 degrees. The Neutral Horizontal Axis (NHA), Frankfurt horizontal (FH), Krogman-Walker plane (KW plane), and Palatal plane (P plane) demonstrated near parallelism with each other, and averaged between 0 and -3 degrees from HOR. On average, EN plane was horizontal but was variable.

**Conclusions:** NHP is not consistently reproducible at the individual level. For hard tissue images, the combined use of NHA, FH, KW plane, and P plane enables prediction of CHP. Additionally, the rectangular shape of the lower orbit - nasal airway region appears to be useful for correcting head position. In facial soft tissue images, EN plane in combination with other visual factors helps to correct head position. Simple geometry enables this head position correction to be performed from any view of the head where relevant landmarks are seen.
Signed statement

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis, when deposited in the University Library, being available for loan and photocopying.

Andrew L. Barbera

Date
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