The changing role of photography in orthodontics

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Since prehistoric times the human face has been recorded on various media; ranging from the crude representations on cave walls to the modern art of photography. Irrespective of chronology, however, the artist has always endeavored to depict the individual in a characteristic pose, for example the portraits of Napoleon Bonaparte.

Orthodontics, common to the era of photography, has likewise recorded the facial appearance of its patients; but, on the other hand, has subjected these patients to a standardized position of the head. Later, these standardized photographs were subject to qualitative and, frequently, quantitative analyses.[12,13] Such analyses were based on the relationship of the facial structures to the Frankfort Horizontal plane and perpendiculars therefrom.

Photographic appraisals, giving a soft tissue record of facial growth and change, have been supplanted by the development of the standardized cephalometric roentgenogram both by Broadbent[1] and Hofrath.[10] The roentgenogram permits a more accurate study of the bony tissue of interest to the orthodontist and, under suitable roentgenographic conditions, the soft tissues may also be examined, adding to the value of cephalometric analyses.

With the application of roentgenology to the study of the facial profile a large number of the previous photographically useful planes of reference and orientation were retained. In this manner the Frankfort Horizontal plane has become extensively used as a reference plane in the development of various cephalometric analyses.[5,15]

Perhaps a few words may be said with regard to the Frankfort Horizontal plane (F.H.P.). The introduction of the German Horizontal plane (later the F.H.P.) into anthropology by von Ihering[11] (1872), was an attempt to portray primate and human skulls in their natural position. This reference plane was received with general acclaim at the Frankfort Agreement of anthropology in 1882. Even so, a few of the signatures to the agreement carried riders to the effect that the position of the head may not necessarily have the F.H.P. parallel to the earth's surface.[7] From the time of von Ihering's work there has been little to substantiate or negate the position of the human head in the living.

Preliminary observations on several children, at the Orthodontic Department, University of Illinois in 1950, revealed a wide range of individual variation of the F.H.P. under identical conditions. Downs, however, has reported the mean value in 100 cases to be close to the horizontal. It is here, perhaps, where photography may play a new part in orthodontic diagnosis; that is, to record, albeit instantaneous, physiologic differences in head position.

The inclination of the F.H.P. is well illustrated in figure 1 in which the supposition that the F.H.P. is horizontal in the analysis of the profile roentgenogram leads to the interpretation of mandibular prognathism. Anatomically this is true, but there appears a physiologic adjustment of the head to minimize the

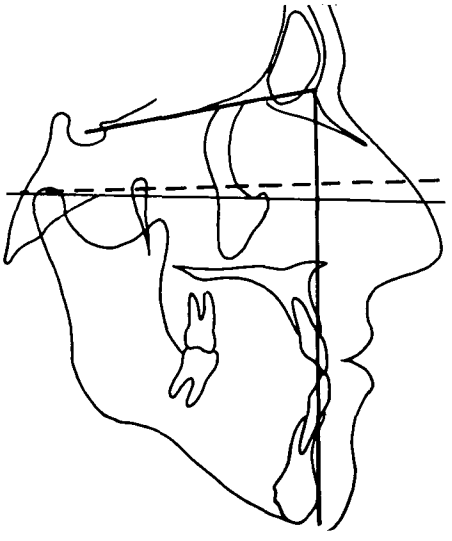

Fig. 1. Tracing from lateral cephalometric roentgenogram showing the Frankfort Horizontal plane (solid line) and superimposed the physiological plane (dotted line) obtained by means of photography.

dysplasia. In this instance photography permitted the physiologic plane to be considered in the cephalometric analysis, reducing the apparent prognathism. However, in the absence of cephalometric roentgenograms standardized photography is the method of choice.

As we all know, each individual has a characteristic gait and standing pose. Indeed, each person has a characteristic 'postural sway', the small amount of bodily movement occuring when a person stands quite still. This latter has been accurately recorded by Hellbrandt et al as a continuously variable but characteristic sway. If the concept, advanced by Brodie, of an anterior chain of muscles with the post cervical muscles as antagonists, were to hold true, the head could be readily placed in a state of balance. Since the total body always has some mass motion, it is likely that the head has a characteristic path of movement. There is some evidence that this may be so in that electro-myographic recordings of the cervical region are never completely silent.

It thus becomes a problem of obtaining records of the characteristic or usual position of the head. Three methods were attempted to record this position photographically. These have been already mentioned by Steinvorth.[14]

First, ablation of the visual field. Gesell[8] has very ably shown the development of the visual field in man and its superiedence over the other senses.

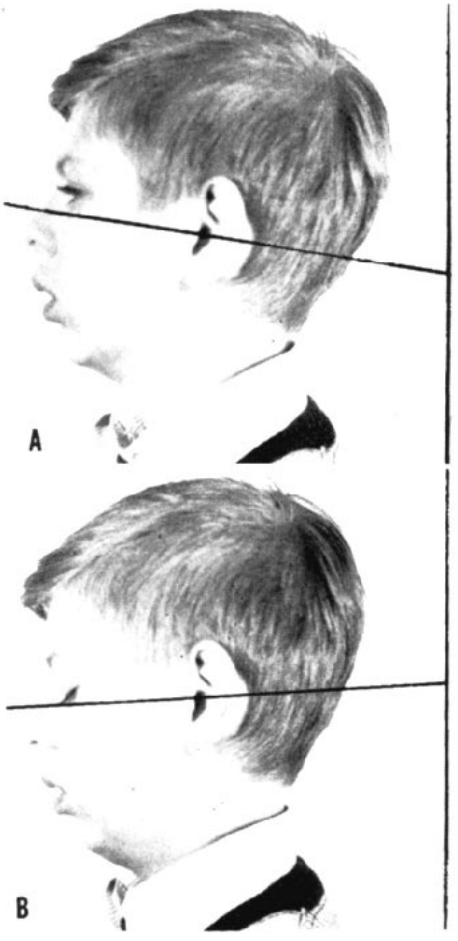

Fig. 2 (a) Photograph of patient with the eyes open, but not focused on any specific site.
(b) Photograph of the same patient a few minutes later with the eyes closed.

Thus the patients were requested to close their eyes while standing still. A slight drop of the head (about 5° change in the F.H.P.) was observed in most cases, while postural sway increased to the extent of making photography difficult. (Figure 2.) The presence of the bright photographic lights may have tended to increase extension of the head, with the eyes open, and thus make the difference appear larger. This first method frequently did not represent the clinical impression of head poise and was consequently discarded.

Second, DeBeer[4] has presented a method of obtaining an 'alert' head position by means of a swift voluntary rotation of the head from left shoulder position to directly in front. This method was used in several patients, but it was found difficult to obtain an instantaneous record of head position at the completion of movement. (Figure 3.) Quite frequently the head swung past the median plane and due to this impractibility the test was discarded.

However, the good photographs showed a close relationship to those of the third method. (Figure 3.)

Third, the utilization of the visual field. The French anthropologist Broca[2] has described the head as being in its usual posture when looking at the horizon. To simulate the horizon the patients were requested to look at the pupils of their own eyes in a mirror about five feet away. DeBeer[4] has shown the variation of this angle of sight to be very low, within a 3° range. It was noticed that postural sway was reduced to a minimum and that a position of the head was obtained which closely represented the usual posture. (Figure 3B.) This method was subsequently used routinely.

The use of photographs to supplement cephalometric analyses is subject to the limitations of an instantaneous exposure. A preferable method would employ a continuous record of head movement; perhaps the fields of cine fluorography and electronics offer means for obtaining such a continuous recording.

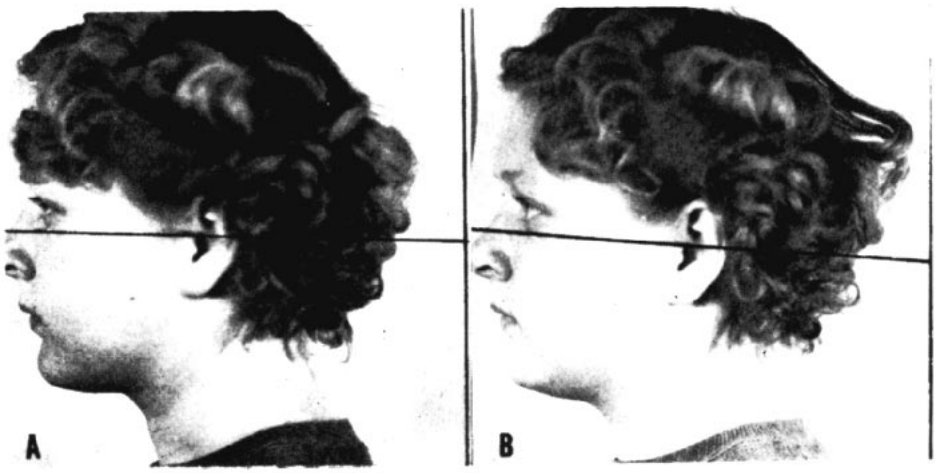

Fig. 3 (a) Patient with the head position described by DeBeer, the 'alert' position.
(b) Patient looking to the horizon, as represented by a mirror.

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