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Atlas Laterality: A Rotational Movement

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W. ROCH JOHNSTON AND TIMOTHY D. DOUGLASS

When the center of the skull tilts toward the lateral edge of the x-ray film, the atlas frontal plane line may be level, or one or two millimeters below level

The atlanto-occipital subluxation in the frontal plane is a rotational movement. Most upper cervical groups refer to the atlas occipital subluxation as "atlas laterality," and this terminology has been used for generations. The atlas rotates superior and around the occipital condyles on the Z-axis in the frontal plane.¹

The anatomical architecture includes the shape of the atlas superior lateral masses and the shape of the occipital condyles. The superior articular facets of the lateral masses are biconcave, cup-shaped, inclined from 30 to 60 degrees and located inferior to the occipital condyles.^{2,3} The superior articular facets of the atlas can be considered as part of a surface of a sphere, with the center located above the articular surfaces.³

M.M. Panjabi and A.A. White's instantaneous axis of rotation (IAR) states that the axis of rotation of the atlas with the

occipital condyles on the frontal plane is 2 to 3 centimeters above the apex of the dens. The inferior articular surfaces of the occipital condyles are biconvex, reciprocally inclined to articulate with the lateral masses and located superior to the lateral masses. These components of the atlanto-occipital articulation predispose the atlas to rotate around the occipital condyles, thus dictating the biomechanics of this region (Fig. 1).

No Translation

In the frontal plane there is no translation of the atlas with the occipital condyles.³ Translation, as defined by *Webster's Collegiate Dictionary*, is "a transformation of coordinates in which the new axes are parallel to the old."⁴ Therefore, the atlas must rotate around the condyles. This is due to the fact that when two pairs of inclined planes articulate, in order for one side to move superior, the other side must move inferior along the in-

clined plane on the opposite side. When the atlas rotates superior around the condyles on the Z-axis, the coordinates on the new axis are not parallel to the old ones. Therefore, it is evident that the atlas does not translate on the condyles.

The atlas frontal plane line is usually high and above level on the side of the subluxation (Figs. 2 and 3). In the atlanto-occipital subluxation, when the center of the skull is near the vertical center of the x-ray, the atlas frontal plane line will be high. When the center of the skull tilts toward the lateral edge of the x-ray film, the atlas frontal plane line may be level, or one or two millimeters below level. This displacement is a rotational movement.⁷

Conclusion

The atlas occipital articulation is a diarthrodial, ellipsoid, freely movable synovial joint.⁸ It can subluxate in all three axes (X, Y and Z). The subluxation can occur in a single axis (single plane), any combination of two axes (coupling) or as a combination of any three axes (multiple planes).

Most upper cervical groups always adjust the atlas-occipital subluxation in the frontal plane on the side of the acute angle. In the atlas orthogonal program, the line drawn through the atlas in the frontal plane is called the atlas frontal plane line (A). The line drawn through the center of the skull in the frontal plane is called the cephalic line (C). When these two lines form an acute angle, we term this the atlas cephalic displacement angle (ACD).

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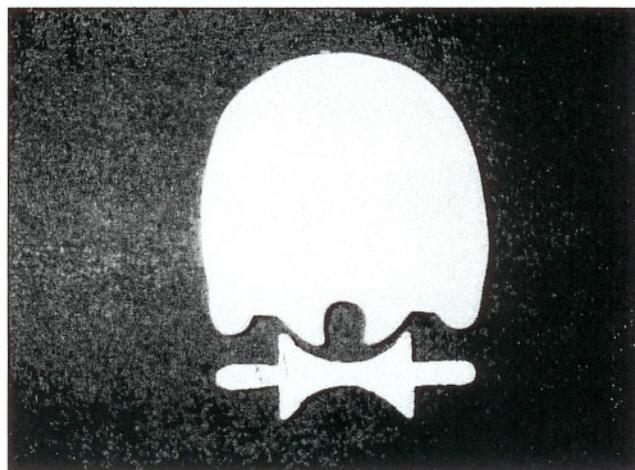


Fig 1

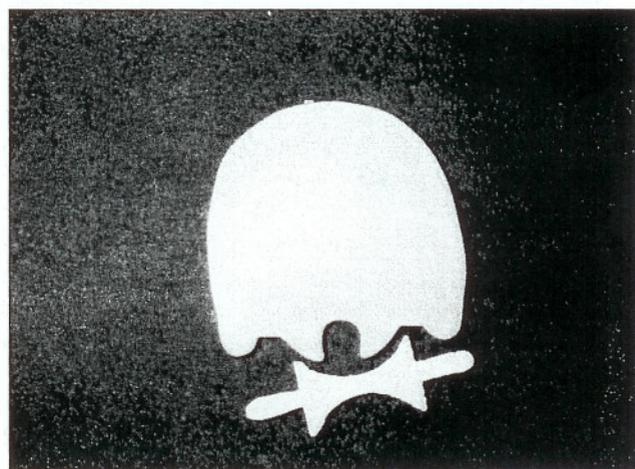


Fig 2

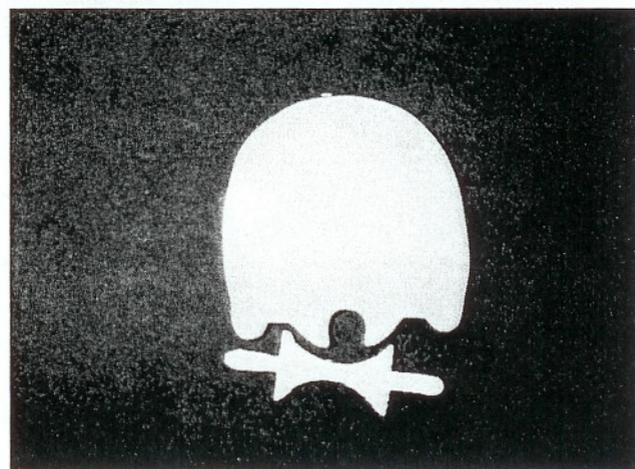


Fig 3