A39 Morphologic Analysis of the Location of the Lens on the Orbit Using 3D Reconstructed Models

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After attending this presentation, attendees will understand the sex differences found using 3D models and landmark coordinates for eyeball placement and the development of regression formulas for lens protrusion. In addition, morphometric characteristics of the orbit according to sex and the use of regression formulas to find the location of the lens center for use in forensic facial reconstruction will be presented.

This presentation will impact the forensic science community by illustrating the sex differences in orbital morphology and a reliable location of the lens for fontal and lateral views. In addition, the regression formulas are developed in this study to find the most probable lens protrusion location.

The goal of this research is to study the relationship between the lens location and the orbit-related structures for eyeball placement in forensic facial reconstruction. A total of 200 high-resolution cranial Computed Tomography (CT) scans were studied. The sample was composed of 100 men and 100 women, with age ranges of 21years to 70 years; the overall mean age was 46 years. The 3D cranium and lens models were reconstructed from the Digital Imaging and Communications in Medicine (DICOM) data using the Mimics® version 16.0. Ten distinct landmarks were indicated on the cranium and lens models. A total of 25 morphological and angular measurements between landmarks including the lens center were measured by the Mimics® software and were analyzed by the Statistical Package for the Social Sciences (SPSS) version 20.0.

The study results describe general orbit morphology and interpret the relationship between orbit-related structures, including the lens center. First, there were sex differences in the orbital morphology and these results match other data of generalized orbital-morphologic differences in males and females. Males had more developed eyebrows and a more receding inferior orbital rim. In addition, males had a bigger orbit and the orbit was rotated in a more clockwise manner. Second, there were no sex differences in lens location; the location of the lens can be estimated regardless of sex. On the frontal view, the lens can be placed at the point of 55.59% of Medial Orbitale (MO)-Lateral Orbitale (LO) breadth horizontally and 48.40% of Superior Orbitale (SO)–Inferior Orbitale (IO) height perpendicularly. On the lateral view, the lens can be placed approximately 1.11mm in front of Orbitale Tangent Plane (OTP) line. In addition, more sophisticated methods using regression formulas can be used to estimate the lens protrusion. The presented first formula is the traditionally used regression formula that is modified for use in Korean populations. The next two formulas are proposed in this study to improve the reliability of lens protrusion, as the first formula has a low $R^{2\ value}$. The morphometric characteristics of the orbit, including the lens center and the regression formula to estimate the location of the lens center, will be helpful for forensic facial reconstruction.

Lens Location, Orbit, Facial Reconstruction