E4 A Study of Morphological and Metric Variations of the Human Ear — Applications in Personal Identification

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After attending this presentation, attendees will understand the significance of the variability of the human ear, which may help them in conducting further studies and in solving forensic cases usually encountered in airplane crashes, intentional mutilation and dismemberment, explosions, or other mass disasters.

This presentation will impact the forensic science community by presenting new information on the variability and uniqueness of the human ear in an Indian population and the usefulness of the human ear in personal identification.

In the past, many morphological and metric features of the human body have been used for personal identification in forensic examinations. Fingerprints, footprints, facial characteristics and features, iris, gait, teeth, bitemarks, gait pattern, lip prints, voice characteristics, and DNA fingerprinting from a variety of tissues of the human body have successfully been utilized in forensic situations as well as for identification of criminals. The human ear is another organ of the body which is unique to an individual. Like fingerprints and other individualistic characteristics of the human body, an ear retains certain individualistic characteristics which are unique due to variations in the anatomical structures of the external ear. In certain situations, where the dead body is recovered in dismembered or mutilated conditions, the shape, size, and individualistic features of a person's ears may be useful in identifying the deceased along with other identification characteristics of the human body. In the recent past, it has also been shown that, like the ear itself, the prints left by the human ear are also individualistic to an individual; the earprints can be left by the criminals/burglars while listening at the doors or windows of the target house. So looking at the value of the human ear in forensic identification, the objective of the present study was to study the morphological and metric characteristics of the human ear in a north Indian population. The sample for the present study is comprised of 90 males and 87 females ranging in age from 18 to 30 years of age taken from the upper reaches of Himachal Pradesh State in North India. The morphological characteristics such as overall shape of the ear, size and shape of the tragus, ear lobe, shape of helix, forms of Darwin's tubercle, and rare and special characteristics as well as congenital deformities were studied in all the subjects. To generate data for the metric characteristics, physiognomic ear length and physiognomic ear breadth were measured using standard landmarks.

The physiognomic ear length and breadth in males were found to be significantly larger than those of the females. The length and breadth measurements of the ear show bilateral variations, although they were statistically insignificant. The other findings of the study indicate that the oval-shaped ear was present among 40% of the males and 44.8% of the females in the study sample. The flat-shaped ear was the rarest variant, reported only among 1.1% of the males in the study. The other types of ear, such as the oblique, rectangular, round, and triangular, were found in both sexes. Bilateral asymmetry exists in regard to the shape of the ear. The size and shape of the tragus also vary with respect to the left and right sides as well in sexes. The ear lobe showed different characteristics in different individuals. In nearly half of the cases in both males and females, the ear lobe was found to be attached to the face; in many cases, it was free, and, in some, partially attached. The size and shape of the ear lobe also showed variations with respect to sides as well as sexes. The shape of the helix varies in individuals showing certain characteristics such as concave, rolled, flat and wide covering scapha, etc. The Darwin tubercle showed a variety of structures in both the left and right sides in both the sexes.

Personal Identification, Human Ear, Variations and Uniqueness