D53 Pre- and Post-Maturation Growth of External Ear: It's Application in Personal Identification

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After attending this presentation, attendees will be aware of the fact that the external ear, which is emerging as one of the leading biometric traits, does not have a permanent form throughout life. The ear can be used as a biometric trait after it attains maturity of form and ceases to be useful when it loses its elasticity and starts elongating.

This presentation will impact the forensic science community by cautioning against indiscriminate use of the external ear for establishing identity throughout life. The study has for the first time furnished data for age of maturation for a central Indian population and also sets the ceiling age of 60 years (from previous study) for the external ear's use as biometric trait.

Establishing identity from the dead or living is a routine job for a forensic scientist and law enforcement agencies. When a person is alive, identification is established by comparing him with his image or identification symbol. In the present electronic age with increased networking in communication, mobility, and advances in technology the conventional methods of identification (i.e.: identification card, magnetic card, password, etc.) are replaced by a faster and more sophisticated method of identification, that is biometrics. Biometrics is the method of identification from physiological & behavioral traits of an individual. The traits can be facial features, fingerprint, hand dimensions, voice, signatures, etc. It is a machine-based vision system in which a database of the traits are stored. During authentication the image/data of the individual taken on the spot is automatically compared with the image/data already stored in the machine. In this context the external ear is emerging as a convenient and dependable biometric trait. One of the essential properties of a biometric trait is constancy of shape and size over time. If the ear undergoes rapid change in its form, there are chances of rejection of an authentic person at the time of verification, in other words the false rejection rate will be too high. Hence, it is of utmost importance for forensic scientists to identify the period during which the proportion of external ear remains unchanged.

An extensive study was undertaken with the goal of determining the age of maturation of the external ear. An earlier study has already determined the age after which the external ear starts elongating. The data was collected from hospitals, schools, day care centers, and residence of the subjects of central India. The subjects were normal and did not suffer from any craniofacial abnormality, malnutrition, or endocrine dysfunction. The sample size of 1,960 consisted of boys (1053) and girls (907) ranging in age from birth to 18 years. To determine the age of maturation of the ear, the age groups were categorized on a yearly basis up to 18 years. In the present study, dimensions have been determined by physically measuring the ear with a sliding caliper (Dial Caliper; Mitutoyo Corporation, Kawasaki, Japan, accuracy 0.01 mm). Consent was sought from the subjects or their parents before taking necessary measurements. The measured dimensions included maximum length, width of external ear, and length and width of lobule. All the measurements except lobular width were taken following the Knußmann method. Lobular width was defined by the author for the current study. The age of maturation was determined by the method suggested by Farkas & Posnick (1992).

The maturation of different dimensions of the external ear in females is found to range from 8 to 12 years, and 11 to 14 years in males. After attaining maturity the proportion of the external ear has been found to remain relatively unchanged until the age of 60 years, after which it starts elongating rapidly. Most of the elongation was attributed to the lobule being made of elastic fiber which is more susceptible to the pull of gravity. Hence, it was inferred that the external ear can be used as a biometric tool for establishing identity from 14 to 60 years among males and from the age of 12 years among females.

The information of age of maturity of the external ear will be of great use to law enforcement agencies for using the ear as a biometric tool.

Personal Identification, Biometrics, External Ear

