A23   A Computed Tomographic Analysis of Medial Clavicular Epiphyseal Fusion for Age Estimation in an Indian Population

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Learning Overview: The goal of this presentation is to showcase the results of the first Computed Tomography (CT) -based study on medial clavicular epiphyseal fusion in an Indian population.

Impact on the Forensic Science Community: This presentation will impact the forensic science community across the globe and especially in the Indian subcontinent by detailing how to estimate age in the living using medial clavicular epiphysis.

Forensic age estimation is one of the "Big 4" of identification and is routinely conducted in identification of both the living and dead. While the conventional radiographic visualization of epiphyseal fusion of long bones for the purpose of age estimation has been researched exhaustively over the 20th century, recently forensic anthropologists and scientists have shifted their focus to the use of medial clavicular epiphyseal fusion in age estimation. Not only can the medial clavicular epiphyseal fusion be used to estimate age in young adults, but it can also be used to determine whether a person has attained the medicolegally significant ages of 16 and 18 years.

The present study aimed at visualizing the status of medial clavicular epiphyseal fusion using CT in an Indian population, scoring the stages of fusion using the methods by Schmeling et al. and Kellinghaus et al., generating regression models using these scores, applying these regression models on a test set to study the variance between chronological age and estimated age of the test set participants, and assessing whether an individual has attained the medicolegally significant ages of 16 and 18 years old. Medial clavicular epiphyseal fusion of 350 participants (147 females and 203 males) aged 10.01–35.47 years was studied to generate regression models. Statistically significant correlation ($p < 0.005$) was observed between the degree of fusion and the chronological age of the participants ($\rho = 0.918$ in females, and $\rho = 0.905$ in males). The regression models generated using the sample set of 350 participants when applied on the test set of 50 participants (25 females, 25 males) showed a mean absolute error of 1.50 for females, 1.14 for males, and 1.32 for the total test set. It was also observed in the present study that all the individuals of either sex, with the incidence of stage 3a or above degree of medial clavicular epiphyseal fusion, were older than 18 years of age. Similarly, presence of stage 1 of the clavicular epiphyseal fusion indicated the individual to be less than 18 years old. The cut off for an individual to be at least 16 years of age was observed to be stage 2b for males and stage 2c in females. For males, individuals with stage 2b and above are definitely at least 16 years old or more, while in females, observation of stage 2c and above in an individual indicates that they are definitely at least 16 years old or more.

The present study is the first CT-based investigation of the medial clavicular epiphyseal fusion's utility in age estimation in the Indian subcontinent. The results of this study will assist the forensic anthropologists and medicolegal professionals of the Indian subcontinent and the rest of the world to accurately estimate age using the medial clavicular epiphyseal fusion in their respective populations.

Age Estimation, Medial Clavicular Epiphysis, Computed Tomography

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