



A78 Forensic Age Estimation by Medial Clavicle Epiphysis Ossification Using Computed Tomography (CT)

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After attending this presentation, attendees will better understand the principles of Forensic Age Estimation (FAE), its importance for law enforcement, how to increase the accuracy of FAE, the use of CT to enhance the precision of clavicular maturity, and CT's practical application.

This presentation will impact the forensic science community by providing knowledge about the role of maturation stages of the clavicle in FAE. In addition, this presentation will highlight the role of CT scans in increasing the accuracy of FAE.

Age estimation is of paramount importance in assisting law enforcement.¹ In many countries, the relevant age limits in criminal laws for the existence of criminal responsibility are between 14 and 21 years. Maturation of sexual characteristics, dental and skeletal, have been used to determine age.² By 18 years of age, most developmental sites have completed their growth, except for the medial epiphysis of clavicles. Therefore, in some countries, radiography or CT scan of the clavicles is used to estimate age in persons presumed to be older than 16, 18, and 21 years.² For example, as per the Association of German Forensic Age Diagnostics (AGFAD) guidelines, X-ray examination of the clavicle to confirm the chronological age of 21 is mandatory.³ Correlations between clavicle maturation and age have long been studied in dry bones and at autopsy.⁴ Recent studies have revealed the utility of imaging tools and, among these, CT has particular advantages.⁵

A retrospective analysis of 556 CT scans of the neck or chest of patients aged between 10 and 30 years was performed. Medical records were reviewed for date of birth and date of performing the CT. All axial and coronal images of 1mm slice thickness were used in the evaluation. The clavicular maturation stages were scored separately by two radiologists without knowledge of the patient's age. The five stages of maturation described by Schmeling et al. and sub-stages of stage 2 and 3 by Kellinghaus were followed.^{4,5}

The results of gender-based comparisons revealed statistically significant differences in mean age at the maturation stages of 1, 3b, and 5. The maturation at stage 1 and stage 3b occurred earlier in females by 16 and 17 months, respectively. In contrast, maturation at stage 5 occurred 12 months earlier in males compared to female counterparts. No statistically significant differences were noted in other maturation stages (2a, 2b, 2c, 3a, 3c, and 4). Maturation stage 3a was first presented at 16 years of age for both sexes. Maturation stage 3b was first presented at age 18 in females and age 16 in males. Maturation stage 3c was first presented at 21 years of age for both sexes.

In conclusion, the CT scan is a useful visualization tool for estimating chronological age. The Kellinghaus sub-stage classification criteria improved accuracy of age estimation, particularly in stage 3. Results suggest using stage 3a of maturation to represent ages >16 years, stage 3b of maturation to represent ages >18 years, and stage 3c to indicate ages >21 years in FAE.

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