

**Preface**

The contents of this write up include the work done on the estimation of age from the clavicular ossification in case of living beings using radiological techniques. Age is one of the basic criteria of the standard requirements in personal identification of cadavers, human remains and living individuals. In case of livings, age is required for forensic purpose in both the aspects, civil and criminal. Parameters of skeletal age estimation vary greatly in different development phases of life, from infancy to adulthood. A number of criteria are available to estimate age in the young age, but the accuracy level is reduced with increasing years. Aging from dentition, ossification centers, epiphyseal union of long bones etc. are considered as reliable methods of estimating age in young age. A well documented data in the literature, regarding the aging from various skeletal regions is available, but comparatively less material is found in published literature for the estimation of age in case of livings. The demand has increased in this regard in the recent years, due to the increased cross border migration all over the world. Globalized economy and belligerent conflicts are the main reasons of this increasing cross border migration. In developing countries, age is required for personal identification, as birth records are not often well maintained there. Forensic age estimation in case of livings, in early adult period (18 to 21 years of age) is mainly required for criminal prosecution, so as to ascertain, whether a suspect without valid identity proof has reached the age of criminal responsibility. In case, the bones of hand of a suspect are found to be completely ossified, an additional examination of clavicle is required to ascertain him to be above 21 years of age, as per the recommendations of ‘Study Group on Forensic Age Diagnostics’. [i]
The development process of the clavicle and the correlation of its status with age have been studied by many research groups, adopting different approaches in different situations. Most of the studies reported are based on conventional radiographs. But the conventional radiographs were found to be suboptimal most of the times. The interpretation of the ossification status was also found to be difficult sometimes due to the overlapping of other osseous structures like ribs and vertebrae lying just at the level of sterno-clavicular joint. With the introduction of techniques like computed tomography in the field of diagnostic radiology, the attention of scientists was drawn to study the clavicular ossification stages using this new modality. Spiral CT, the advanced model of CT scan was used for the first time in 1998 to study clavicular ossification and found to be a better modality in providing vastly improved visualization of anatomical structures without the overlapping of other bones. Later on with the onset of further advancements in CT technology, MDCT (Multi Detector-row Computed Tomography) machines were introduced in the diagnostic radiology, facilitating the acquisition of ultra-thin slices with high resolution using less scan time and providing large scan-length coverage in single breadth-hold. The most advantageous feature provided in these modern scanners is Automatic Exposure Control (AEC), so as to perform the scanning with comparatively reduced dose delivered to the patient without deteriorating diagnostic quality of the scan. In present study, the clavicular ossification status for the purpose of age estimation has been compiled and documented. The ossification status of bilateral clavicles has been studied using 16-slice MDCT (Multi Detector-row Computed Tomography) in both male and female subjects. The effect of slice thickness on ossification stage determination has also been reported. Automatic Exposure Control (AEC) technique has been used to
reduce the radiation dose delivered to the subject in CT protocols. The effect of the dose reduction on the quality of scans used for ossification stage determination has also been studied. A comparison of two imaging techniques (Digital X-rays and CT) has been made to know which technique is more dependable with respect to the accuracy in ascertaining the stage of ossification.

I hope the results of this research will have far reaching effect to enhance the confidence level of the forensic radiologists in ascertaining the age from the ossification status of the clavicle.

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