

The application of histomorphometry to puberty in the archaeological record

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Adolescence is marked by the onset of puberty whereby hormonal changes cause the body to mature into its reproductive capacity, adult body size, and behavioural maturity. Specific bony secondary sexual characteristics develop during the six stages of puberty: initiation, acceleration, peak height velocity, deceleration, maturity, and completion. Macroscopic skeletal indicators of puberty provide one way to estimate the stage of puberty attained at the time of death.

This study determines if underlying microscopic changes in bone growth are linked to the macroscopic skeletal stages of puberty. Age-at-death was reconstructed from dental formation for 40 juvenile skeletons from Blackgate, Newcastle ($n=17$), Fishergate Barbican, York ($n=13$), and St Gregory's Priory, Canterbury ($n=10$). Pubertal stage was estimated from the hamate hook, distal hand phalanges, distal radius, proximal ulna, iliac crest, cervical vertebrae, and mandibular canine root. Microscopic features of bone remodelling were measured from previously produced histological thin-sections of the anterior humerus mid-shaft ($n=40$) using CellSens analysis software. Secondary osteon density, size, and shape parameters were measured.

Analyses revealed a curvilinear relationship between puberty stage and bone remodelling. Osteon population density increases during the acceleration phase of puberty and then tapers off throughout subsequent puberty stages. This indicates that pubertal stage relates to bone remodelling, with the fastest remodelling being associated with the most rapid puberty stage. This is the first study to explore the possible link between puberty and microstructural bone growth.

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