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Ontogenesis of femoral biomechanical properties in non-human primates: study of olive baboon Aix*Marseille ADES UMR 7268 EFS

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Introduction

The locomotor repertoire of olive baboons (Papio anubis) evolves through age. Autonomous around 0.5y old, diversified in infants (< 1.8y), the repertoire becomes highly stereotyped with an extreme predominance of quadrupedalism in adults (> 4.75y). Biomechanical properties of the femoral diaphysis are considered to record the locomotor strains; it is thus expected that they reflect behavioral changes and diversity through age.

Material - A transversal ontogenetic sample of olive baboons: 65 3D-reconstructed femora - A single social group, from Primatology Station, UPS 846 of CNRS, (Rousset, France) - Changes in locomotor repertoire are known [1]





Method - Cross-section geometry parameters: cortical area (%CA) and bending rigidity on the mediolateral (ML) and anteroposterior (AP) axes (Ix/Iy and Zx/Zy) along the diaphysis

- Cortical thickness maps
- Morphomap R-package [2]

CROSS SECTION GEOMETRY PARAMETERS

Results

Newborns and young infants present: 2 - The highest %CA - Symetrical cortical bone distribution \Im along the longitudinal axis

- AP oriention of bending rigidity at midshaft

In later stages:

- Cortical bone distribution shifts proximally and posteriorly - Bending rigidity is ML oriented in



the distal half

Cross section geometry parameters along in the femoral diaphysis, mean by stage.

CORTICAL THICKNESS MAPS



PCA based on thickness values of maps coordinates.

Discussion The pattern of newborn femora reflects conditions where locomotor strains are nil: a centrifuge ossification from the center of ossification. From this condition, biomechanical properties evolve quickly through age toward a pattern largely impacted by quadrupedal locomotion, as soon as the locomotor autonomy is established. Contrary to what was expected, biomechanical properties of the femoral diaphysis do not reflect the behavioral changes and diversity but seem to be linked to the most predominant mode.

References [1]Druelle, F., Aerts, P., Berillon, G., 2016. Am. J. Primatol. 78, 1201–1221. https://doi.org/10.1002/ajp.22575 [2]Hunt, K.D., 2016. J. Anat. 228, 630–685. https://doi.org/10.1111/joa.12454 [3]Profico, A., Bondioli, L., Raia, *et al.,* 2020. Am. J. Phys. Anthropol. 174, 129–139. https://doi.org/10.1002/ajpa.24140

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