Title

A quantitative comparison of the brain and the inner surface of the cranium

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Abstract (250 words)

Endocasts of fossil crania are replicas of the internal table of the bony braincase and provide the only direct evidence of brain evolution. In this context, endocasts constitute a critical proxy for investigating and quantifying variations in global brain shape and organisation, including imprints of cerebral convolutions, and for reconstructing the evolutionary history of the brain in extinct taxa. However, the correspondence of the brain and the endocranial shapes, as well as the coincidence of the gyral and sulcal pattern in the brain with the bulges and furrows imprinted on the braincase, have been largely questioned in paleoneurology. By means of imaging techniques (i.e., MRIs and CT scans) and 3D modelling methods, in this study we collected consistent morphological and structural information on the variation patterns between the brain and the endocast based on a sample of extant human individuals (N=7) from the clinical record of the Steve Biko Hospital in Pretoria (South Africa). Brain and endocranial surfaces were virtually extracted respectively from the MRIs and CT scans of the same individual by using the BrainVISA and Endex software and the sulcal imprints were automatically detected. We performed a deformation-based shape analysis to compare both the shape and the sulcal pattern of the brain and the endocast via Deformetrica. By assessing for the first time the quantitative comparison of the shape and organisation of the brain and the endocast, this work will constitute a usefull reference for paleoneurological studies.