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Birth canal shape and fetal rotation in Australopithecus and Neandertals

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For decades, researchers have sought to understand when and why human childbirth became more difficult than birth in other primates. Previous research utilized human-defined obstetric planes (inlet, midplane, outlet) to evaluate birth mechanisms in fossil hominins. We have previously shown that these three pelvic planes do not accurately indicate points of fetal obstruction. Instead, the whole birth canal must be analyzed to examine how changing dimensions throughout the birth canal affect fetal descent.

In this research, the reconstructed shapes and minimum dimensions of the entire canal in five fossil hominins (A.L. 288-1, Sts14, Sts 65, MH2, Tabun 1) were compared with estimated fetal dimensions (head and shoulder breadth) in order to identify points of potential obstruction and probable birth mechanisms. Each hominin's birth canal shape is unique and shows multiple points of constriction not captured by the traditional three-plane analysis. Inter- and intraspecific differences indicate that the degree of birth difficulty depends on many factors. In the early australopithecines A.L. 288-1, Sts 14, and Sts 65, the risk of dystocia comes from both the fetal head and shoulders. In the later MH2 specimen (*Australopithecus sediba)*, neither the fetal head nor shoulder breadth would have produced obstruction. In the Tabun Neandertal, estimated fetal shoulder breadth, but not head size, exceeds birth-canal dimensions. This research indicates that adaptations to reduce obstetric constraints (cranial molding, pelvic ligamentary relaxation) may have arisen in the hominin lineage considerably earlier than previously thought.

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