Curved spines and pregnant primates

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A recent (December 2007) *Nature* research paper[1] has had the media buzzing with reports of how human females had allegedly evolved a clever way of dealing with the problem of carrying a heavy baby while walking upright. Human females, unlike apes such as chimps, walk habitually upright. So this creates a unique load/stress on their spines when pregnant. The researchers found that human females have a different spinal structure from males that makes it possible for them to avoid damaging their spines while still keeping their balance and walking upright, even when heavily pregnant. As the baby gets heavier and heavier, the centre of gravity shifts substantially forward, so it is no longer over the hips. Females compensate by leaning backwards more, increasing the curvature in their lower back to shift the centre of mass back towards the hip line again.

The differences between human males and females in the lower back are as follows:

- The associated 'facet' joints in women are larger relative to the size of the vertebral bones and angled slightly differently. These subtle but significant differences mean that they can bear more load than would otherwise be the case.
- The vertebrae taper backwards into a wedge shape that enables a greater curvature, especially given that women have three such wedge-shaped lumbar vertebral bones (L3, 4 and 5), compared to two in men (L4 and 5). That makes it easier for them to form a natural curve that reduces the 'shearing stress' in pregnancy. So women can bend backwards to realign their centre of gravity much more readily than men could if they had the same increase in abdominal mass.

Upright-walking ancestors?

Within the *Nature* article was an interesting claim by these researchers, namely that certain fossil specimens of *Australopithecus africanus* they studied, from the South Africa's Sterkfontein caves, allegedly showed that australopithecines had the same set of spinal design features. Media reports based on the article (which was less dogmatic than this) claimed that, as with humans, australopithecine females have these, but not the males. It appears that of the two *africanus* specimens studied, one had three wedge-shaped lower vertebrae, one only had two.

So for evolutionists the implication is that our 'hominin' ancestors were already walking upright two million years ago, so they needed to have this feature to help them cope with pregnancy. It 'evolved early'. But what is being said here about the australopithecines appears to conflict with the findings and pronouncements of other evolutionists themselves, as mentioned later.

Of course, if some extinct non-human creatures did walk habitually upright, this is not of itself an indication that they were ancestors of humans. At best, it would be merely consistent with that belief. Belief in human evolution demands upright-walking ancestors in our lineage, but evidence of upright-walking does not demand that a fossil creature be a human ancestor.[2]

Australopithecus africanus not really upright

However, the reality is that on the basis of quite convincing fossil evidence, the australopithecines that have been touted as our ancestors[3] by many evolutionists (not all[4]) almost certainly *did not habitually walk upright*, at least not in a human-like manner. And this includes *A. africanus*, the species about which these latest claims have been made. This species was among the fossil types studied by Professor Fred Spoor, a distinguished evolutionary paleoanthropologist who used CAT scans to look at the anatomy of the semicircular canals, the structures in the skull that house the organ of balance. This is quite different in creatures that walk habitually upright as opposed to those, like chimps and gorillas, that do not. Spoor's findings indicated that the australopithecines did not group with humans in that regard, but were rather chimp-like in the mode of locomotion indicated by this evidence (the semicircular canals are often very well preserved even in otherwise fragmentary skulls).[5]

Other evidence consistent with this is the conclusion by a prominent evolutionary anatomist[6] that the australopithecines had a unique, rolling mode of locomotion, not at all like human walking (or ape locomotion, for that matter). They also had the long arms, and curved hands and feet, characteristic of tree-dwellers. And consistent with all of this is the discovery that even the famous australopithecine 'Lucy' had the wrist-locking mechanism characteristic of knuckle-walkers, like chimps or gorillas.[7]

Interpreting the data

What is one to do, then, with these latest reports, that the australopithecines are supposed to show these same sorts of spinal design features in females

Photo by Brent Allison, www.sxc.hu

Human females have a different spinal structure from males that makes it possible for them to avoid damaging their spines while still keeping their balance and walking upright, even when heavily pregnant.

(but not males)? There seem to be only a few options.

Either:

- The previous conclusions by prominent evolutionists about australopithecines *not* walking upright are all just plain wrong. The 'copout' by the majority of evolutionists, who desperately need these creatures to be ancestors, that they sometimes walked upright, mostly not, won't really 'cut it' in this case. Such a detailed feature as this spinal one would not be needed at all for pregnant australopithecines if they had upright walking as only an occasional option.

Or:

- These latest reported conclusions about the *africanus* fossil bones are themselves in error. Despite these two being the most complete australopithecine spines ever found, this may be a live possibility. No detailed diagrams or actual photographs of the fossil vertebrae were given in the article. Note that the researchers' reasoning did not go: 'Based on other anatomical considerations, this one is a female, and that one a male, and here are the differences between the female and male lumbar vertebrae.' Rather, they seem to have had to use the number of wedge-shaped vertebrae to deduce the sex of the creature—which for one thing implies that the rest of the skeletons were not exactly intact, to put it mildly.

Photo by Iwan Beijes, www.sxc.hu

The semicircular canals, the structures in the skull that house the organ of balance, are quite different in creatures that habitually walk upright as opposed to those, like chimps and gorillas, that do not. Australopithecines do not group with humans in this regard, but are rather chimp-like in the mode of locomotion.

Difference in lumbar vertebrae

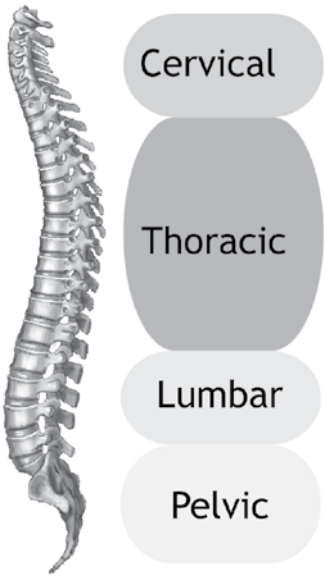
Possibly complicating matters still further, australopithecines appear to have had six lumbar vertebrae, not five, as is the case in humans. For one of these Sterkfontein specimens (Sts 14), the researchers provide in their graph the associated joint angles of all six lumbar vertebrae, but for the other (Stw 431) there are only three, L3, L5 and L6—indicating something about the degree of preservation of the ones not mentioned. The only photo of Stw 431's skeletal remains that I could find on the web at the time of writing (low resolution, with no close-up of the vertebrae) suggests that for some of the lower vertebrae of this one at least, the results given in the *Nature* article may owe something to reconstruction and interpolation, rather than purely observation and measurement.

To their credit, the authors (unlike some of the news reports) are appropriately cautious. Concerning the differences they report between the lumbar vertebrae of Sts 14 and Stw 431, they make the very conservative comment that the notion that these differences are there because one specimen is of a female and the other a male is 'one possible explanation'.

When one is dealing with such a small sample size, pathology is a possibility, too. For instance, there is in humans a condition called Sheuermann's disease that affects the development of the thoracic vertebrae in particular, resulting in a wedge shape—only in the opposite direction. Similar issues may be impossible to exclude, particularly if some of the vertebrae are poorly preserved.

Conclusion

Of course, supporting the authors' comment that this is in any case 'intriguing' is their report that this parallel to the case of the human female



Australopithecines appear to have had six lumbar vertebrae, not five, as is the case in humans. Even if female australopithecines are shown to have a different spinal structure from that of males, as noted between human females and males, it may only mean they walked upright while carrying their babies.

is not just to do with the vertebral wedging, but also the stronger angling of the associated small joints. If these same features, associated with the same sexual dimorphism,[8] were consistently able to be documented in a representative sample of future specimens, it would be a powerful indicator that the apelike *Australopithecus africanus* did walk upright—at least, while carrying its babies. But this would have to be weighed against equally powerful evidence that it was not a habitual upright walker. While such a confusing outcome is not impossible, it seems somewhat unlikely; it may be that future well-preserved australopithecine spines, when found, will disappoint in this regard.

Perhaps, once the hype settles down, some evolutionists will themselves comment on this apparent inconsistency. Further developments are awaited with interest.

References

1. Whitcome, K.K., Shapiro, L.J. and Lieberman, D.E., Fetal load and the evolution of lumbar lordosis in bipedal hominins, *Nature* **450**:1075–1078, 2007.

2. In fact, some creationist students of the fossil bones believe that e.g. Lucy's pelvis was consistent with bipedalism. See Murdock, M., These apes were made for walking: the pelves of *Australopithecus afarensis* and *Australopithecus africanus*, *Journal of Creation* **20**(2):104–112, 2006.
3. Chiefly *A. afarensis* (of which 'Lucy' is the best-known) and the later (by evolutionary 'dating') *A. africanus*, of which Raymond Dart's Taung child was the earliest discovery.
4. The ones who deny that the australopithecines were in the human line include Charles Oxnard, who was Professor of Human Anatomy at both the University of Western Australia and the University of California at Santa Barbara. Oxnard performed detailed multivariate computer analyses of the fossil anatomy of the creatures, comparing them to humans and living apes, to try to remove the 'subjective' element from such studies.
5. Spoor, F., Wood, B. and Zonneveld, F., Implications of early hominid morphology for evolution of human bipedal locomotion, *Nature* **369**(6482):645–648, 1994.
6. Charles Oxnard, already mentioned in reference 4.
7. See Oard, M., Did Lucy walk upright? *Journal of Creation* **15**(2):104–112, 2001, <www.creationontheweb.com/content/view/1823/>; and Catchpoole, D., New evidence: Lucy was a knuckle-walker, 5 May 2000, <www.creationontheweb.com/content/view/3655/>. If Lucy were already walking around like humans, what was natural selection doing not getting rid of such a useless structure?
8. A term used to describe consistent differences of form in males and females within a given species.

Dinosaur demise did not jump start mammal evolution

Michael J. Oard

You have heard it said that the mammals were small and undiversified during the time of the dinosaurs, but then after the dinosaurs became extinct the mammals blossomed tremendously in an 'adaptive radiation'. Robert Carroll writes: 'The extinction of the dinosaurs left vacant a broad range of adaptive zones that were subsequently occupied by therian mammals.'[1]

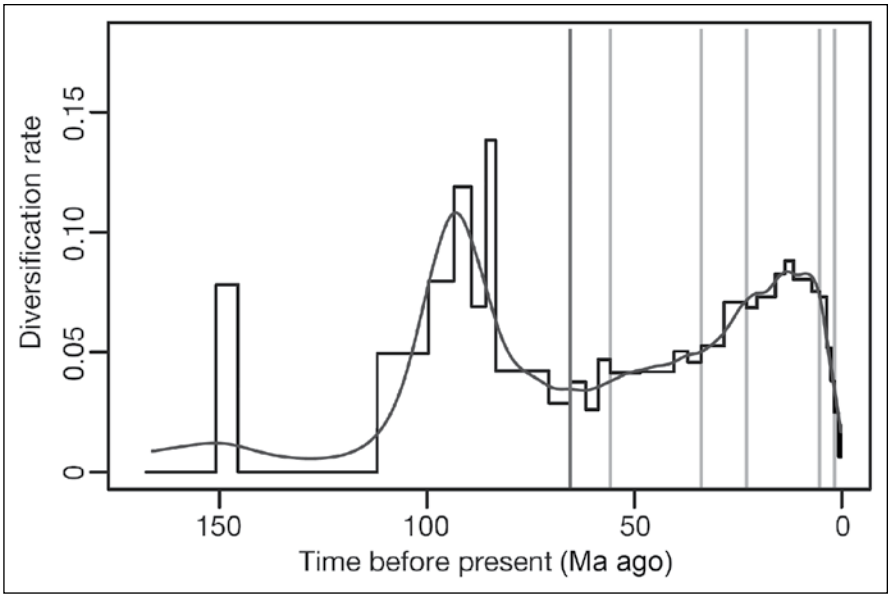
The notion of an adaptive radiation is considered to be based on the fossil record. However, the age distribution of fossils is partly based on circular reasoning.[2–5] In other words, the finding of a dinosaur automatically places the rock containing the fossil into the Mesozoic, and mammalian fossils are always assumed to be Cenozoic. Similarly, the end of the Cretaceous is often defined as the last preserved dinosaur in a vertical sequence.[6]

A new article in *Nature* now claims that this evolutionary belief is a myth.[7] Bininda-Emonds and others have constructed an evolutionary lineage of nearly all living mammals using DNA comparisons tied to fossil dates for the beginning of major lineages. They have called their results 'supertrees'. The authors admit that using molecular data alone or fossil data alone sometimes gives *conflicting* results:

> 'Molecular data and the fossil record can give conflicting views of the evolutionary past.'[8]

In the case of mammals, the fossil record favoured (or at least had favoured) an explosive increase in mammal diversification just after the Cretaceous/Tertiary (K/T) boundary, but the molecular data pushed most origins of the same orders back into the Late Cretaceous.[8] The authors compiled a huge data set, and from the phylogenies they developed they were able to estimate diversification rates with time, all within the evolutionary paradigm of course.

Because their analysis is tied to the recent findings of many complex mammals in the Jurassic and Cretaceous,[9,10] their diversity analysis showed an increase in diversity in the



Net mammal diversification rate according to the latest uniformitarian sources. Note little change through the Cretaceous/Tertiary boundary but diversity rates peak in Mid-Cretaceous and Miocene. (After Bininda-Emonds *et al.*,[7] p. 510, figure 2b).