



We'd like your views – write to: The Editor, *Bone & Joint*³⁶⁰,
22 Buckingham Street, London WC2N 6ET or email editor360@boneandjoint.org.uk

Reply to “The distance between the midline of the pelvis and the centre of the femoral head in adult humans”

Dear Sir,

I thank Mr Bardakos and Mr Freeman for their kind words and intriguing data on pelvic anatomy and its gender differences.

Concerning the main point of their paper, the near-uniformity of the distance between the femoral heads, the fact that male and female mean values fall outside the 95% confidence interval for the group overall, suggests there is a significant gender difference (non-uniformity), with males having a larger distance, i.e. wider pelvis.

In my article for *Bone & Joint*³⁶⁰,¹ I referred to work by Dr Tague, who found a larger absolute biacetabular distance in females, measured between “the middle of both acetabula”.² Over 900 pelvises were measured, and black, Indian and white populations all showed a larger distance in females. The overall mean was 123 mm for females and 115 mm for males. Other references for this measure are older, and harder to find, e.g. from populations in Japan,³ but do show a similar picture of larger distance between the acetabula in females than males, even in absolute terms.

This makes the findings of Mr Bardakos and Mr Freeman all the more intriguing. One can speculate about differences between males and females in body-size-related enlargement of the radiograph, or that the difference is relatively small compared with the difference in femoral head size, but these are, I believe, minor issues given the magnitude of differences as reported above. I have no satisfactory explanation for the “reversed” gender difference as reported by Mr Bardakos and Mr Freeman.

Conversely, their statement that “the increased width of female pelvis does not translate to the femoral head being lateralised away from the midline to the same extent (at least in Caucasian populations)” aligns with our ideas on the importance of the abductor mechanism in the obligate bipedal gait of humans. Bluntly put, perhaps “everything has gotten wider” in the female pelvis – to facilitate birth of a large-brained foetus – except the hips, for which a more lateral position would decrease gait efficiency.

To further examine the importance of the abductor mechanism and gait efficiency, one should measure not only the moment arm of body weight, but also that of the abductor muscles. We have done so in 83 healthy controls and 113 arthroplasty patients (unpublished data, Table I). We use a ratio, the Abductor moment arm Ratio (abductor ratio or AR), to quantify the relationship between the moment arms. AR is expressed as the length of the moment arm of body weight (half the distance between the centre of both femoral heads) divided by the abductor moment arm (distance from the femoral head centre to the trochanteric gluteus medius insertion). A high AR, signifying the need for increased abductor work, would increase hip joint contact force, which may perhaps influence hip OA development.

Table I. Abductor moment ratios

	Males	Females	p-value
Controls	1.47 (0.07)	1.66 (0.11)	<0.001
Patients	1.57 (0.17)	1.68 (0.15)	<0.001
All	1.53 (0.15)	1.67 (0.13)	<0.001

We found a higher AR in females in both controls and arthroplasty patients. But in coxa profunda patients, AR was lower than in non-profunda patients (1.54 and 1.61, respectively, $p < 0.05$), indicating coxa profunda may be useful in increasing gait efficiency (unpublished data).

Tom Hogervorst, MD, PhD, Orthopaedic Surgeon, Haga Hospital, Sportlaan 600, 2566 MJ, The Hague, The Netherlands.

REFERENCES

- Hogervorst T. Osteoarthritis: a consequence of evolution? *Bone Joint* 360 2012;1:6-10.
- Tague RG. Commonalities in dimorphism and variability in the anthropoid pelvis, with implications for the fossil record. *J Hum Evol* 1991;21-3:153-176.
- Martin R, Saller K. Knochengerüst. In: *Lehrbuch der Anthropologie. Band II. Vol. 2*. Stuttgart: Gustav Fischer Verlag, 1959:1071 (in German).