Supporting online material
S1. Comparison of Lesedi landmark reconstructions (only 81 preserved landmarks)
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S1. Comparison of Lesedi landmark reconstructions (only preserved 81 landmarks)

The results of geometric morphometric analyses are not greatly affected by the choice of which Lesedi ilium reconstruction is used. To verify this, we did a generalized Procrustes analysis of the 23 humans, 2 australopiths, and 2 Lesedi reconstructions (Lesedi-A and Lesedi-H for the reconstructions based on the australopiths and humans, respectively), and measured shape difference between pairs of individuals as their Procrustes distance (PD). The humans are only in developmental Stages 1–2 (acetabulum unfused). We also performed principal components analysis (PCA) using either Lesedi reconstruction. We first consider the dataset including only the 81 landmarks representing the preserved surface of the Lesedi ilium.

![Diagram](image)

**Figure S1.** Shape comparison of two reconstructions of the Lesedi ilium, including only the 81 preserved landmarks. The boxplot on the left compares Procrustes distances between pairs of humans (grey), with the fifth percentile indicated by the horizontal line. Gold box and whiskers show the Procrustes distances between each Lesedi reconstruction and all humans. Procrustes distance between the australopiths (MLD 7 and MLD 25) and each Lesedi reconstruction are labeled in pink. The graphs in the center and right show the first two principal components of shape variation, with humans represented as black circles, australopiths as pink triangles, and the Lesedi ilium as a gold square; point sizes are proportional to their landmark centroid size.

Using only the landmarks preserved on the Lesedi ilium (81 of the full 148 landmark set), two main things stand out. First, the two reconstructions are quite similar to one another (diamond in boxplot). The two Lesedi reconstructions have a PD of 0.035, whereas the lowest PD among humans is 0.040, and the PD between MLD 7 and 25 is 0.125. Thus, the two reconstructions are more similar to one another than different individuals are to one another. Second, the Lesedi ilium is more similar to australopiths than to humans. For both reconstructions, Lesedi-Australopith PDs are within the 50% quartile of humans (i.e., shape similarity between the reconstructions and australopiths are comparable to pairs of humans). In addition, Lesedi-Australopith PDs are lower than all Lesedi-Human PDs.
PCA results are virtually identical regardless of which reconstruction is used, although axes are inverted. In each case, PC1 explains about 27% of variance and completely separates modern humans from fossil hominins. Intraspecific variation is captured in PC2 (explaining about 17% of variance in both cases). Lesedi plots slightly toward the “human” direction on PC1, and is intermediate between the australopiths on PC2.
S2. Comparison of Lesedi landmark reconstructions (all 148 landmarks with estimation)

We repeated the shape analysis described in S2, this time using the full set of 148 landmarks (i.e., with 67 missing landmarks estimated from both australopith and human templates). Although these reconstructions are more distinct from one another than the 81-landmark configurations, results are still very similar regardless of which reconstruction is used in shape analysis.

![Figure S2. Shape comparison of two reconstructions of the Lesedi ilium, with missing landmarks estimated. See Fig. S2 caption for information about the plots.](image)

First, the overall shapes of the two Lesedi reconstructions are very similar to one another. The PD between the two reconstructions is 0.051 (diamond in boxplot), which is lower than that between MLD 7 and MLD 25 (PD=0.113). Among human ilia (left, grey box and whiskers), pairwise PD ranges from 0.039–0.153, and only 2/253 human pairwise PDs are as low as PD between the two Lesedi reconstructions. The Lesedi reconstruction PD is far below the human PD 5th percentile (horizontal line in boxplot). Thus, the two reconstructions are more similar to one another than nearly all possible dyads in the comparative sample.

Second, both reconstructions are more similar to the australopiths (pink labels) than to humans (gold boxes and whiskers). Each reconstruction shows affinities with australopiths and humans as would be expected given the references for estimating missing data (e.g., Lesedi-A closer than Lesedi-H to australopiths), but the PD between reconstructions and australopiths are all lower than PD between reconstructions and humans.

In addition to the overall similarity between the two reconstructions, use of either does not appreciably affect PCA results (center and right graphs in Fig. S2). In either case, PC1 explains 23–25% of shape variance, while PC2 explains just under 16% of
variance. In either case, PC1 chiefly separates humans along one end of the axis from australopiths and Lesedi. In contrast to 81-preserved landmark analysis (S1), the relative position of the Lesedi ilium differs depending on the reconstruction used: the australopith-based reconstruction plotting intermediately between MLD 7 and MLD 25 along both PCs 1 and 2. The human-based reconstruction plots more positively (i.e., in the human direction) along PC1.

To summarize S1 and S2, results comparing different reconstructions of the Lesedi ilium, demonstrate that 1) the choice of reconstruction has little effect on overall shape comparisons, and 2) regardless of the reconstruction, the overall shape of the Lesedi ilium is more similar to immature australopiths than to immature humans.
**S3. Intraobserver landmark error**
Comparison of Procrustes distance between same individuals measured three times (Triplicates) and between individuals and all 22 other humans in the GM analysis.

| Triplicate (individual) | Landmark set     | Intra-Triplicate Procrustes Distance | Extra-Triplicate Procrustes Distance |
|-------------------------|------------------|-------------------------------------|-------------------------------------|
| Set 1                   | 8 (Fixed only)   | 0.054–0.063                         | 0.080–0.160                         |
|                         | 148 (Full)       | 0.032–0.042                         | 0.072–0.134                         |
| Set 2                   | 8 (Fixed only)   | 0.024–0.033                         | 0.066–0.194                         |
|                         | 148 (Full)       | 0.021–0.025                         | 0.060–0.119                         |
| Set 3                   | 8 (Fixed only)   | 0.024–0.043                         | 0.049–0.148                         |
|                         | 148 (Full)       | 0.016–0.024                         | 0.043–0.147                         |