Evaluation of the Superior Pubic Ramus and Supra-Acetabular Corridors Using Statistical Shape Modeling

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Purpose: The incidence of osteoporotic pelvic fractures is increasing. The broken anterior pelvic ring is preferentially fixed with long intramedullary screws, which require a good understanding of the patient-specific anatomy to prevent joint perforation. The aim of this study was to assess the variability of the superior pubic ramus and the supra-acetabular corridors' length and width using statistical shape modeling.

Methods: A male and female statistical shape model (SSM) was made based on 59 forensic CT scans. For the superior pubic ramus and the supra-acetabular corridor, the longest and widest completely fitting cylinder was created for the first 5 principal components (PCs) of both models, male and female pelvises separately.

Results: A total of 59 pelvises were included in this study, of which 36 were male and 23 female. The first 5 PCs explained 75% and 79% of the pelvic variation in males and females, respectively. Within 3 PCs of the female SSM, a superior pubic ramus corridor of <7.3 mm was found, 5.5 mm being the narrowest linear corridor measured. Both corridors in all PCs of the male SSM measured >7.3 mm.

Conclusion: Within females, a 7.3-mm and 6.5-mm screw will not always fit in the superior pubic ramus corridor, especially if a flat sacrum, a small pelvis, or a wide subpubic angle are present. The supra-acetabular corridor did not seem to have sex-specific differences. In the supra-acetabular corridor, there was always enough space to accommodate a 7.3-mm screw, both in males and females.