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Paper 1: Morphology of the Proximal Femur with Special Regard to the Natural Asphericity of the Head-Neck Junction: A Computed Tomography Study of 1312 Femurs

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SUMMARY

This cross-sectional 3-dimensional CT study of a large random cohort assessed normative data on the alpha angle and the distribution of its maxima around the femoral head-neck junction. Influence of gender, age and ethnic background as well as additional asphericities at the posterosuperior and inferior head-neck junction were assessed.

DATA

Background: Femoral head asphericity is common in femoroacetabular impingement (FAI) and usually quantified by the alpha angle on radiographs or MRI. However, plain radiographs and MRI only assess the alpha angle in predefined planes, and continuous circumferential analysis of the head-neck junction has not yet been performed. The purpose of the study was to determine the natural alpha angle in a large unselected cohort by continuous circumferential 360° analysis with computed tomography (CT).

Methods: In this cross-sectional study, CT scans of 1312 femurs of 656 subjects (294 women, 362 men) were reviewed retrospectively for asphericities of the head-neck junction. CT scans had been performed for reasons other than hip disease (70% CT angiography, 20% polytrauma, 10% others), and subjects with known hip disease, fracture, dysplasia, and others were excluded. Digital circumferential analysis allowed continuous determination of the alpha angle around the entire head-

neck junction. A p-value < 0.05 was considered significant.

Results: The mean alpha angle of the cohort was $58.99 \pm 9.44^\circ$ with a maximum located at 48° of the head-neck circumference (superior = 0° ; anterior = 90°), which corresponds to 01:52 on the clock face. The alpha angle was significantly higher in men ($59.43 \pm 8.04^\circ$) compared to women ($53.45 \pm 7.35^\circ$; $p < 0.0005$), and higher in Caucasians ($60.74 \pm 8.99^\circ$) compared to Africans ($56.26 \pm 7.95^\circ$; $p = 0.007$) and Asians ($50.76 \pm 7.21^\circ$; $p < 0.0005$). Alpha angle showed only little correlation with age (coefficient of correlation 0.23), and there was no side difference. When measured at predefined planes (e.g. 12:00, 01:00, and 03:00 position), the alpha angle was significantly underestimated by more than 4° , whereas measurement at 01:30 and 02:00 showed underestimation of less than 2° . Furthermore, two additional maxima of asphericity were determined at the posterosuperior and inferior head-neck junction.

Conclusions: Circumferential analysis of the head-neck asphericity by CT in a large random cohort suggests that alpha angles are commonly underestimated when measured in predefined planes on radiographs or by MRI. The present study provides important data on the average alpha angle and its distribution around the head-neck junction, which is important for the interpretation of “normal” and “pathologic” alpha angles in the clinical setting.

Paper 2: Comparison of Planned Resection of Cam Impingement Between High and Low Volume Arthroscopists

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SUMMARY

We investigated pre-operative planning using X-rays for FAI osteoplasty to elucidate factors that indicate low