The influence of head and neck geometry on stability of total hip replacement: a mechanical test study.

BACKGROUND: Dislocation after replacement may be caused by poor implant design or positioning, or by the surgical approach taken. We evaluated the influence of head and neck design on range of motion and stability (with respect to risk of dislocation) in total hip endoprostheses. MATERIAL AND METHODS: Using a test device, we determined the stability afforded by different head sizes and neck geometries for various implant positions. RESULTS: Increasing head diameter led to an enhancement of range of motion as well as resistance against subluxation, and thus to improved stability in any movement combination and implant orientation. Smaller femoral heads were associated with increased risk of dislocation, especially in a poor implant position such as retroversion, and steep positioning of the cup. Skirted metal or mushroom-shaped ceramic heads had a reduced range of motion until impingement of approx. 20 degrees, as compared to spherical standard heads. Furthermore, after identical joint loading, skirted heads dislocated more readily than standard heads with corresponding diameters. INTERPRETATION: To obtain sufficient joint mobility and stability, neck geometry and implant position should be considered when choosing the femoral head size.

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