

Measurements of femoral antetorsion values for straight standard and short modular hip stems by THA navigation

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Purpose: Reconstruction of offset, limb length and antetorsion of the femoral hip center influence joint function in THA. In straight stems femoral antetorsion can be adjusted by the rotational stem positioning in the femur. In short metaphyseal stems the rotational head position is influenced by the anatomical anteversion of the femoral neck. Intra-op data in navigated THA may show differences of antetorsion values for straight or short hip stems and lead to a differentiated correction for an optimum safe and high ROM.

Methods: We evaluated the antetorsion values of both stem types by intraoperative navigation data to study possible differences for the realization of a physiological center of rotation. We focused the study on femoral antetorsion values which we select intraoperatively within a value of 10 to 15deg independent from the selected type of stem implant. The straight stem used has a low profile, which allowed to vary the rotational values when inserting it into the femoral canal. The short stem followed the anatomical antetorsion of the femoral neck and by this their probable pathological shape. To correct this modular necks with variable ante- or retrotorsion to correct these orientation were used. In our series a 7.5° correction was possible in both directions and the CCD angle could be chosen from 130°, 135° and 140°. In both stems, short and straight, the femoral head could be chosen in different length, influencing both length and offset. Both stems were inserted under control of a navigation system that we use routinely, which allowed to chose the optimum position for a safe high range of motion. The correct values were chosen intraoperatively.

We compared data of 86 THA with a modular short metaphyseal stem and 58 THA with a straight standard stem. All THA were implanted using an imageless computer assisted navigation system with femoral and acetabular tracker references. Preoperative and postoperative antetorsion in straight stem THA and the intraoperative antetorsion with or without modular neck correction of the metaphyseal anchored short hip stem were compared.

Results: Preoperative antetorsion ranged from -12° to +51°, average postoperative antetorsion was 15.8° in straight stems, 16.9° in modular short stems and would have increased to 18.3° without the use of a correcting modular adapter. Correction angles in both groups ranged from 36° into retrotorsion for highly anteverted femoral necks to 15° into antetorsion in retroverted necks. Expectedly a gender difference could be found in the distribution of ante- and retroversion. Not all short hip stems could be inserted or adjusted to an antetorsion within a range of 10 to 15 deg and showed higher antetorsion values. Mainly a retroverted correction was necessary, but a surprisingly high number of THR needed an anteverted correction to restore optimum biomechanics. Even slight changes affected the ROM. Still all THR could achieve a safe range of motion without postoperative dislocations. A correction of the femoral antetorsion seems to be essential for the biomechanics of the hip and can only be achieved by thoroughly controlling of the stem position or the right choice of a modular neck under control of navigation.