BACKGROUND: Despite great advances in hip alloarthroplasty there are still numerous indications for joint-saving procedures such as correction osteotomies. Often these procedures include complex 3D rearrangements of the proximal femur, which are for the surgeon technically very demanding. The project aim was to develop a precise intraoperative virtual 3D planning tool including a detailed biomechanical analysis and enable the surgeon to realize exactly this plan by using computer-assisted techniques. METHODS: Using only two different angled fluoro frames a simplified femoral model was inversely constructed. For navigation a passive optical system was used with a C-arm calibration kit and PC-based software. For in vitro evaluation complex osteotomies were performed on ten femora under simulated OR conditions. RESULTS: The mean difference between the planning and real surgical outcome for the wedge size was less then 2 degrees and for the femur head center position less then 4 mm. No implant penetrated the femur neck isthmus. CONCLUSION: Without changing the standard operative procedure the method can be of high clinical importance to improve planning accuracy and consecutive operative realization for precise fragment positioning and plate location without penetrating the isthmus of the femoral neck. And besides precision -- it can potentially help to reduce intraoperative complications such as implant
penetration and minimize X-ray use.