Abstract:

Restoration of biomechanics is a major goal in THA. Imageless navigation enables intraoperative control of leg length equalization and offset reconstruction. However, the effect of navigation compared with intraoperative fluoroscopy is unclear. We asked whether intraoperative use of imageless navigation (1) improves the relative accuracy of leg length and global and femoral offset restoration; (2) increases the absolute precision of leg length and global and femoral offset equalization; and (3) reduces outliers in a reconstruction zone of ± 5 mm for leg length and global and femoral offset restoration compared with intraoperative fluoroscopy during minimally invasive (MIS) THA with the patient in a lateral decubitus position. In this prospective study a consecutive series of 125 patients were randomized to either navigation-guided or fluoroscopy-controlled THA using sealed, opaque envelopes. All patients received the same cementless prosthetic components through an anterolateral MIS approach while they were in a lateral decubitus position. Leg length, global or total offset (representing the combination of femoral and acetabular offset), and femoral offset differences were restored using either navigation or fluoroscopy. Postoperatively, residual leg length and global and femoral
offset discrepancies were analyzed on magnification-corrected radiographs of the pelvis by an independent and blinded examiner using digital planning software. Accuracy was defined as the relative postoperative difference between the surgically treated and the unaffected contralateral side for leg length and offset, respectively; precision was defined as the absolute postoperative deviation of leg length and global and femoral offset regardless of lengthening or shortening of leg length and offset throughout the THA. All analyses were performed per intention-to-treat. Analyzing the relative accuracy of leg length restoration we found a mean difference of 0.2 mm (95% CI, -1.0 to +1.4 mm; p = 0.729) between fluoroscopy and navigation, 0.2 mm (95 % CI, -0.9 to +1.3 mm; p = 0.740) for global offset and 1.7 mm (95 % CI, +0.4 to +2.9 mm; p = 0.008) for femoral offset. For the absolute precision of leg length and global and femoral offset equalization, there was a mean difference of 1.7 ± 0.3 mm (p< 0.001) between fluoroscopy and navigation. The biomechanical reconstruction with a residual leg length and global and femoral offset discrepancy less than 5 mm and less than 8 mm, respectively, succeeded in 93% and 98%, respectively, in the navigation group and in 54% and 95%, respectively, in the fluoroscopy group. Intraoperative fluoroscopy and imageless navigation seem equivalent in accuracy and precision to reconstruct leg length and global and femoral offset during MIS THA with the patient in the lateral decubitus position.