

**Influence of Lower Limb Alignment on Leg Length Discrepancy after Total Hip Arthroplasty**

Fujimaki, H; Inaba, Y; Kobayashi, N; Yuzawa, H; Ishida, T; Iwamoto, N; Choe, H; Ike, H; Tezuka, T; Hirata, Y; Saito, T

+Yokohama City University, Yokohama, Japan

Yute0131@med.yokohama-cu.ac.jp

**Introduction**

In case of long-term hip osteoarthritis with leg length discrepancy (LLD), lower limb alignment may change. In general, lower limb alignment tends to be valgus in the short leg and varus in the long leg. If leg length is equalized by total hip arthroplasty (THA), it is believed that lower limb alignment will improve, however there are no reports that describe change in lower limb alignment after THA.

It is common to measure LLD on radiographs of the pelvis, but this method may be inaccurate when lower limb alignment is varus or valgus severely. The aims of this study were firstly to investigate change in lower limb alignment after THA, and secondly to examine the influence of lower limb alignment on LLD after THA.

**Materials and Methods**

Ninety-eight patients (75 female and 23 male) who underwent primary THA were included in this study. The mean age at surgery was 64 years (39-81). There were eighty-three cases of osteoarthritis, fourteen cases of osteonecrosis, and one case of rheumatoid arthritis. Patients who underwent additional surgery (i.e. total knee arthroplasty, contralateral THA, or surgery for trauma) were excluded. All patients involved in this study were followed up for at least 1 year after THA.

For all patients, we obtained LLD on radiographs of the pelvis and both whole lower legs in standing position, before and 3, 6, and 12 months after THA. We measured distances from the interteardrop line to tip of the lesser trochanter, and to center of the femoral head on radiographs of the pelvis. We also measured length of the mechanical axis (from center of the femoral head to center of the ankle joint) and the femorotibial angle (FTA) on radiographs of the whole leg. We calculated difference in distances from the interteardrop line to tip of the lesser trochanter between the affected and unaffected legs to determine LLD on radiographs of the pelvis, and also calculated difference in lengths of the corrected mechanical axes from height of center of the femoral head to determine LLD on radiographs of the whole lower legs. We then compared LLD as measured on radiographs of the pelvis to LLD as measured on radiographs of the whole lower leg, and investigated influence of lower limb alignment on discrepancy of LLDs between radiographs of the pelvis and whole lower legs. Chronological change in FTA after THA was also investigated.

This prospective randomized study was approved by our Institutional Review Board, and written informed consents were obtained from all patients.

**Results**

The LLD of the affected leg changed from 175±0.4° preoperatively to 176±0.5° at 1 year postoperatively. The affected leg tended to be varus after THA (p<0.0002). The FTA of the unaffected leg changed from 177±0.4° preoperatively to 177±0.4° at 1 year postoperatively. The change after THA was not significant.

LLD (affected – unaffected) as measured on radiographs of the pelvis improved from -9.8±1.2mm preoperatively to 1.7±0.9mm at 1 year after THA. LLD as measured on radiographs of the whole lower leg also improved from -10.6±1.2mm preoperatively to -0.9±1.0mm at 1 year after THA. Elongation of the affected leg from preoperatively measured on radiographs of the pelvis was 11.4±0.8mm, whereas that measured on radiographs of the whole lower leg was 9.7±1.0mm (p=0.0023). Values measured on radiographs of the whole lower leg were smaller than values measured on radiographs of the pelvis. Discrepancy between these two values correlated significantly with the FTA of the affected leg at 1 year after THA (R² = 0.20, p=0.005). Discrepancy between these two values tended to be smaller as the FTA of the affected leg became larger.

**Discussion**

Elongation of the affected leg after THA as measured on radiographs of the pelvis did not necessarily match with elongation as measured on radiographs of the whole lower leg. This discrepancy was thought to be affected by lower limb alignment.

Before THA, the affected short leg was more valgus than the unaffected leg. After THA, with the leg length discrepancy was corrected, the affected leg tended to be varus from the preoperative FTA and the discrepancy in FTA between the affected and unaffected legs tended to be corrected. In the current study, the difference between two values of elongation in the affected leg measured on radiographs of the pelvis and the whole lower leg was shown to correlate with the FTA of the affected leg after THA. The FTA of the unaffected leg was 177° before THA and did not change after THA. When the FTA of the affected leg was smaller than 177° after THA, elongation measured on radiographs of the whole lower leg tended to be smaller than elongation measured on radiographs of the pelvis. When the FTA of the affected leg was larger than 177° after THA, elongation measured on radiographs of the whole lower leg tended to be larger than elongation measured on radiographs of the pelvis. These two values of elongation of the affected leg were equal only when the FTA of the affected leg was around 177° after THA. This suggests that intraoperative correction of leg length discrepancy based on height of the lesser trochanter accurately reflects the correction of the whole leg length discrepancy only when the lower limb alignments are bilaterally symmetrical.

We must consider lower limb alignment when we correct leg length discrepancy in cases with asymmetrical lower limb alignment.

**References**