Leg length discrepancy and femoral offset after total hip arthroplasty
Clinical and radiological studies

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Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av medicine doktorsexamen framläggs till offentligt förvar i Aulan, Länssjukhuset Sundsvall-Härnösand, Fredagen den 12 Februray, kl. 09:00.
Avhandlingen kommer att förvaras på svenska.

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Abstract

Every year, about 16000 patients in Sweden undergo total hip arthroplasty (THA). This surgical intervention is considered a successful, safe and cost-effective procedure to regain pain-free mobility and restore hip joint function in patients suffering from severe hip joint disease or trauma. Besides relieving the pain, restoration of biomechanical forces around the hip with appropriate femoral offset (FO), leg length and proper component position and orientation are important goals. It remains controversial as to how much postoperative leg length discrepancy (LLD) and FO change are acceptable. Generally, lengthening of the operated leg ≥ 10 mm and FO reduction of the operated hip > 5 mm should be avoided by using preoperative radiological templating and intraoperative measurement methods. There is no consensus on the association between LLD and FO and outcome after THA.

Study I: A prospective cohort study of 174 patients with unilateral osteoarthritis (OA), comparing patients with lengthening ≥ 10 mm, restoration (between 9 mm lengthening and 5 mm shortening) or shortening > 5 mm of the operated leg after THA. Follow up was 12–15 months. We found that a LLD of up to 20 mm did not influence the functional outcome (WOMAC) or QoL (EQ-5D).

Study II: A prospective cohort study of 222 patients with unilateral hip OA, comparing patients with decreased global FO (> 5 mm reduction), restored FO (within 5 mm restoration), and increased FO (> 5 mm increment) after THA. Follow up was 12–15 months. We found that global FO reduction was statistically significantly associated with reduced abductor muscle strength. The incidence of residual hip pain and analgesics use was similar in the 3 groups.

Study III: A prospective cohort study of 90 patients with primary unilateral OA treated with THA. Global FO using the Sundsvall method, global FO (standard method), LLD, acetabular cup inclination and anteversion were measured on postoperative radiographs. The interobserver and intraobserver reliability were tested using three independent observers. We found that the Sundsvall method is as reliable as the standard method and the evaluated radiographic measurement methods have the required validity and reliability to be used in clinical practice.

Study IV: A prospective cohort study of 174 patients with unilateral primary OA treated with THA. LLD and global FO were measured on postoperative radiographs. Patients with lengthening of the operated leg ≥ 10 mm (n=41) and patients with reduction of global FO > 5 mm (n=58) were further studied to investigate the amount of lengthening and global FO reduction that took place in the stem and in the cup compared with the contralateral side. We found that post-THA lengthening of the operated leg ≥ 10mm was mainly caused by improper placement of the femoral stem, whereas a decrease of global FO > 5 was caused by improper placement of both acetabular and femoral components.

The main conclusions of this thesis are:

• LLD up to 20 mm and reduced global FO more than 5 mm did not influence the functional outcome or quality of life at 12–15 months postoperatively.
• Lengthening ≥ 10mm was associated with increased use of a shoe lift. A reduction of global FO more than 5 mm compared to the contralateral hip was associated with weaker hip abductor muscles and more use of walking aids.
• The radiographic measurement methods of LLD, global FO, cup inclination and anteversion have the required validity and reliability to be used in clinical practice.
• Lengthening of the operated leg is mainly caused by improper femoral stem positioning while global FO reduction results from improper positioning of both acetabular and femoral components.

Keywords

Total hip arthroplasty; leg length discrepancy; femoral offset; WOMAC; quality of life; complication; radiographic measurements; acetabular cup; inclination; anteversion

Number of pages: 84+ 4 papers