EFFECT OF FEMORAL OFFSET ALTERATION ON GAIT AFTER TOTAL HIP ARTHROPLASTY

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INTRODUCTION:

The femoral off-set (FO) and limb length have to be restored during total hip arthroplasty in order to improve the functional outcomes and to decrease the risk of limping and dislocation. A decrease of 15% in femoral off-set (FO) was reported to generate a weakness of the abductor muscle after THA, which may increase the risk of limping and dislocation (1). However, this value was defined under experimental conditions using a CYBEX machine, which does not correspond to daily life activities.

It may be difficult to assess the functional consequences of an isolated FO alteration because all the other hip anatomical parameters have to be restored in order to be able to draw conclusions.

To our best knowledge, there is no reported study about the effect of the FO alteration on the gait, following THA.

METHODS:

To assess the functional consequences of an alteration in the FO, a prospective comparative study was carried out and it included patients who underwent THA for primary osteoarthritis.

In order to select only patients with an isolated FO alteration, the three-dimensional hip anatomy was analysed preoperatively and postoperatively with CT-scans using HipPlan Software (2). Three groups were defined according to the FO alteration: 15% decrease, restored and 15% increase. The exclusion criteria were: the presence of an arthropathy or of an associated pathology on the contra-lateral or the same limb, a spine disease and a non-restoration of the other hip parameters (center of rotation, limb length).

26 patients were included: 12 restored, 9 decreased FO and 5 increased FO. The patients were composed of 20 women and 6 men with an average age of 67.7 ± 9 years.

All the patients were assessed clinically, pre-operatively and 1 year after surgery with 4 scores: the Poste Merle d’Aubigné score, the Harris score, the womac score and the quality of life score SF12.

A gait analysis was performed at 1 year follow-up using an ambulatory device (Physilog (3)) under normal walking conditions. The patients were asked to walk at their usual normal speed for 30 metres in a standardized corridor; Each limb was compared to the contra-lateral healthy limb.

RESULTS

Contrary to the restored and the increased groups, there was in the decreased group a significant asymmetry between the operated limb and the healthy side with a decreased knee range of motion (8°, p=0.004) and a lower maximal swing speed. (30°/s, p<0.01). (Figure 1)

There was no significant difference in the clinical scores between the three groups. However, there was a significant decrease in hip adduction in the decreased FO group (7.4°, p=0.0008) (Figure 2)

DISCUSSION:

The main finding of this study was that an isolated decrease in FO after THA generated an alteration of the gait with a lower swing speed and a decreased knee range of motion when walking.

All the patients were free of associated diseases, and the FO was the only hip anatomy parameter modified. Indeed, the three dimensional hip anatomy was assessed before and after surgery using CT scans and a specific software designed for 3D planning of THA.

A 15% decrease in FO was proved to induce a gait asymmetry in the sagittal plane. This should be kept in mind for THA planning because X-rays underestimate the FO of up to 20%. This is why, the authors use now routinely CT-scan in order to perform a three-dimensional preoperative planning for THA.

There was no significant difference between the groups regarding the clinical scores. However, the hip adduction was significantly decreased in the decreased FO group. Furthermore, there were functional consequences on the knee with a decreased motion when walking. These scores may be not adapted for an accurate clinical assessment after THA for young and active patients who have highly demanding physical activities.

The main limitation of this study was that the gait was analyzed only in the sagittal plane. A three dimensional analysis of the gait will be performed in the same groups in order to get more information especially regarding the forces.

REFERENCES:
3- Aminian et al, 2004 Gait 291-296

Figure 1 In the group of patients who had a decrease in FO after THA, there was a significant decrease in maximal swing speed comparatively to the healthy contra-lateral limb

Figure 2 In the group of patients who had a decrease in FO after THA, there was a significant decrease in the hip ROM in adduction