INTRODUCTION

Total hip arthroplasty (THA) is performed for many patients of osteoarthritis of hip all over the world, and has been recognized as effective treatment for hip pain relief. Probably, gait form would be improved due to the hip pain relief after THA in many patients, however, there are few studies that investigated the plantar pressure in detail before and after THA quantitatively.

F-scan is a useful system that can measure the plantar pressure and its distribution on whole foot accurately, and its simple format is proper for clinical use.

The aim of this study was to analyze the distribution of plantar pressure at standing position, and investigate the center of foot pressure (COFP), that might reflect the weight bearing balance, before and after THA prospectively.

MATERIALS AND METHODS

Forty patients (male 7, female 33) who had undergone primary THA were submitted to this prospective study with informed consents. The average age at operation was 66 years (range, 53–77). The average follow up period was 21.4 month (range, 6–24). Patients who have any lower leg disturbances except hip joint was excluded from this study.

F-scan system (Tekscan, Inc., S. Boston, MA, USA) was applied for the measurement of plantar pressure. The measurement was performed one week before operation and 6 month after operation. The distribution of plantar pressure at standing position was measured for 8 seconds on flat floor with bare feet at first. The foot pressure was measured for three parts; forefoot, midfoot, and heel (Figure 1). We can see the real-time pressure distribution in separated window for each side, 13 different colors (red; highest pressure, blue; lowest pressure) means the load of pressure on each sensor. Then, patients were asked to walk barefoot along the walkway at their normal walking speed, and at least three recordings were made for each foot. After COFP coordinates were converted to ASC data, the anteroposterior (AP) and mediolateral (ML) displacement of COFP were measured.

Harris hip score (HHS) was used for clinical assessment. Student’s t-test was used for statistical analysis.

RESULTS

HHS was improved significantly from preoperative 46.3 ± 15.7 point to postoperative 87.3 ± 8.3 point. The total plantar pressure of THA side increased after operation, especially on heel. Figure 2 shows the heel pressure balance at standing position before and after operation. On normal side, heel pressure decreased after operation significantly. Figure 3 shows the COFP path for a representative case. The OA side (Lt) revealed relatively irregular path compared to normal side (Rt) preoperatively, in the other words, it showed shorter length and wider path than normal side pre operatively. On the other hand, the COFP path on THA side prominently after operation, which showed smooth curve from heel to forefoot. This improvement of the COFP path was recognized in many cases. Figure 4 shows the differences of the length of the COFP path between before and after operation. At THA side, the length had tendency to increase after operation. There was no significant difference between before and after operation for the width of COFP path.

DISCUSSION

There has not been any studies that investigated the detailed plantar pressure before and after THA. Tanaka et al. investigated and compared the plantar pressure between young and old aged patients, and described that heel pressure was significantly higher in old patients and that old patients revealed irregular balance of plantar pressure. Mira et al. investigated the plantar pressure for rheumatoid arthritis patients, and described that shorter length of the COFP path was recognized after operation. Similarly to these reports, also we recognized the higher distribution of plantar pressure, which right and left balance was significantly improved after operation, and recognized the tendency to increase the COFP path length after operation.

We quantified the improvement of gait form after THA using F-scan system, which may contribute to the assessment or modification for more efficient postoperative rehabilitation.

REFERENCES
