Preoperative Objective Activity Levels of Patients Who Underwent Total Hip Arthroplasty Influence Forgotten Joint Score-12 at One-Year Postoperatively

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INTRODUCTION:

Although some studies have primarily focused on objective physical activity (OPA) as the recovery process after total hip arthroplasty (THA), the correlation between patient satisfaction level and OPA has been sporadically reported. Recently, many smart media devices, including portable accelerometers, have been used to measure OPA after THA. However, previous studies have not assessed OPA with sufficient frequency and follow-up period for the OPA recovery process. This study aims to comprehensively assess the factors influencing patient satisfaction and Forgotten Joint Score-12 (FJS-12), and the impact of preoperative OPA on the postoperative recovery process after THA, enhancing the understanding of these critical aspects.

METHODS:

A prospective cohort study was conducted, enrolling 137 patients who underwent unilateral primary THA based on strict inclusion and exclusion criteria (Fig. 1). OPA was measured using a triaxial accelerometer, and data were collected for at least two weeks at each timepoint; preoperatively, 1, 2, 3, 6, and 12 months postoperatively. Ex was measured in metabolic equivalents (METs) per day, and total Ex was the sum of gait Ex and actives of daily living (ADL) Ex, as classified and measured using the device's algorithm. To investigate the impact of preoperative OPA baseline on the postoperative recovery process, patients were classified into four groups based on age and preoperative total Ex; Group 1 (67 ≥ age and low-activity), Group 2 (67 ≥ age and high-activity), Group 3 (67 < age and low-activity), Group 4 (67 < age and high-activity). The OPA recovery process in each group and the recovery rate were investigated; (OPA at 12 months postoperatively – preoperative OPA) / preoperative OPA (%). Patient-reported outcomes were evaluated using the Japanese Orthopaedic Association Hip-Disease Evaluation Questionnaire (JHEQ), the visual analog scale of dissatisfaction with the JHEQ (JHEQ-VAS), and Oxford Hip Score (OHS) preoperatively and postoperatively at 6 and 12 months, and FJS-12 at 6 and 12 months postoperatively. Multiple regression analysis was performed to investigate the OPA affecting JHEQ-VAS and FJS-12 at 12 months postoperatively.

RESULTS:

Total Ex at 12 months postoperatively were 5.2 METs/day in group 2 (younger and high-activity), 3.5 METs/day in group 4 (older and high-activity), 3.2 METs/day in group 1 (younger and low-activity), and 1.8 METs/day in group 3 (older and low-activity). Group 1 achieved preoperative OPA levels within three months postoperatively. The recovery rate varied from 39% to 122% in walking time, steps, total Ex, gait Ex, and ADL Ex. In contrast, group 2 took approximately five months to reach the preoperative OPA levels, and the recovery rate varied from 7% to 17%. Group 3 achieved preoperative OPA levels in less than two months. The recovery rate varied from 69% to 312%, while group 4 required approximately five months. The recovery rate varied from 5% to 34% (Fig. 2). Preoperative total Ex and ADL Ex at six months postoperatively significantly influenced FJS-12 at 12 months postoperatively, whereas no significant influence of OPA on patient satisfaction was found (Table 1). The recovery process of OPA in all patients revealed that Ex took longer to reach the preoperative levels than steps and walking time (Table 2). Patient-reported outcomes were significantly improved from preoperatively to six months postoperatively (Table 3).

DISCUSSION AND CONCLUSION:

Substantial differences in the baseline and the process of recovery for OPA among patients indicate the need for individual recovery goals. This study, which had frequent follow up and meticulously recorded data, demonstrated that total Ex at 12 months postoperatively related to preoperative activity and age, and pre-and postoperative parameters of OPA influenced FJS-12 at 12 months postoperatively. In addition, preoperative low-activity patients reached and surpassed their baseline of OPA quickly, while high-activity patients took longer due to their high baseline. These findings suggest that defining clear objectives for enhancing OPA after THA may enhance patient satisfaction. Therefore, surgeons should effectively communicate to patients that higher preoperative OPA levels correspond to a longer recovery time, facilitating improved patient satisfaction following THA.

Fig. 1 Flow chart of study recruitment

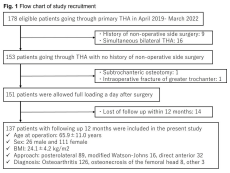

Fig. 2 Characteristics of OPA recovery process in the four groups

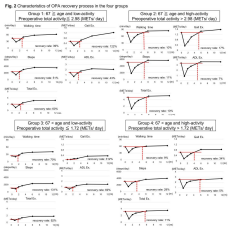

Table 1 Result of multiple regression analysis of OPA factors affecting JHEQ-VAS and FJS at 12 months postoperatively

Parameters	Pre-THA	Post 1m	Post 2m	Post 3m	Post 6m	Post 12m
With post 12m JHEQ-VAS						
Walking time	0.808	0.100	0.671	0.863	0.881	0.204
Steps	0.943	0.112	0.431	0.885	0.380	0.215
Total Ex	0.302	0.757	0.135	0.358	0.735	0.963
Gait Ex.	0.313	0.702	0.060	0.451	0.668	0.858
ADL Ex	0.663	0.914	0.150	0.609	0.154	0.739
With post 12m FJS						
Walking time	0.967	0.435	0.814	0.793	0.597	0.588
Steps	0.937	0.373	0.518	0.844	0.696	0.723
Total Ex	**0.042**	0.782	0.585	0.378	0.551	0.671
Gait Ex.	0.799	0.868	0.783	0.217	0.484	0.886
ADL Ex	0.169	0.877	0.722	0.274	**0.016**	0.866

P-value

Table 2 Outcomes of objective physical activity assessment using triaxial accelerometer

Parameters	Pre-THA	Post 1w	Post 2w	Post 3w	Post 6w	Post 12w
Walking time (min/day)	58.0 ± 32.1	28.9 ± 14.3	42.2 ± 20.8	51.7 ± 27	60.5 ± 31.7	62.8 ± 32.6
Steps (steps/day)	2858 ± 2330	1428 ± 1120	2068 ± 1680	2628 ± 2103	3048 ± 2380	3948 ± 2940
Total Ex (METs/day)	2.70 ± 1.68	0.93 ± 0.641	2.05 ± 1.19	2.59 ± 1.67	3.16 ± 1.92	3.68 ± 2.40
Gait Ex (METs/day)	0.66 ± 0.88	0.28 ± 0.36	0.41 ± 0.69	0.59 ± 0.68	0.92 ± 0.92	1.03 ± 1.14
ADL Ex (METs/day)	2.05 ± 1.34	0.72 ± 0.43	1.65 ± 0.97	1.99 ± 1.06	2.44 ± 1.36	2.48 ± 1.34

Mean ± SD

Table 3 Outcomes of patients' subjective evaluation

Type of evaluation	Pre-THA	Post-6m	Post-12m	P value*
JHEQ-VAS (/100mm)	87.21 ± 15.42	9.03 ± 15.62	9.51 ± 16.38	<0.001 / 0.733
JHEQ (/64)	21.54 ± 13.48	65.39 ± 14.17	66.32 ± 13.79	<0.001 / 0.268
OHS (/48)	35.08 ± 8.83	16.30 ± 5.07	15.77 ± 4.46	<0.001 / 0.182
FJS (/100)	-	72.55 ± 20.87	74.92 ± 19.41	- / 0.180

*Baseline vs post 6m / post 6m vs post 12m
Paired t test
Mean ± SD
JHEQ, Japanese Orthopaedic Association Hip-Disease Evaluation Questionnaire; OHS, Oxford Hip Score; FJS, Forgotten Joint Score