

【資 料】

人工股関節全置換術後患者の退院移行期における 各種歩行指標に関する予備的研究

A preliminary Study on the Several Walking Indicators in Discharge Transition Period following Total Hip Arthroplasty

佐野かおり¹⁾, 宮島 朝子²⁾, 真継 和子¹⁾
後藤 公志³⁾, 杉本 正幸⁴⁾

Kaori Sano¹⁾, Asako Miyajima²⁾, Kazuko Matsugi¹⁾,
Koji Goto³⁾, Masayuki Sugimoto⁴⁾

キーワード：人工股関節置換術，歩行指標，退院移行

Key Words：THA, walking indicator, discharge transition period

I. Introduction

With the increase in the elderly population, the number of persons with locomotive syndrome, which leads to disorders of the musculoskeletal system, is also increasing. Hip joint disease is one of the manifestations of locomotive syndrome, and the hip joint plays an important role in walking and maintaining posture. When daily activities become difficult due to pain or limited range of motion, a total hip arthroplasty (THA) is often indicated. Research on follow-up after THA includes reports that activity tends to decrease quickly among patients who are elderly and living alone (Montin L, et al., 2002.; Pablo P, et al., 2004.; Stevens M, et al., 2007). These studies show that specific instructions on daily life activities are often lacking or insufficient, even when patients understand how to prevent hip dislocation.

An increase in the number of steps over a

6-month period has also been reported (Groot IB, et al., 2008), indicating that time is required for recovery and for walking ability to improve. However, it should be pointed out that study was conducted after a certain period of time had elapsed since discharge. No studies have examined walking status from immediately before to just after discharge. As excessive walking and running can cause wear to an artificial joint, moderate walking only is recommended for the muscles surrounding the hip to recover (Kuster MS, 2002).

However, as it is clear that some patients feel anxious about their return to normal life and the possibility of complications (Johansson K, et al. 2002), they may have overly and unnecessarily restricted their walking activity.

Therefore, it is necessary to clarify the walking situation and walking quality in daily life so that appropriate instructions can be given in accord-

1) Department of Home Care Nursing, Osaka Medical College, 2) Department of Human Health Sciences, Graduate School of Medicine Kyoto University, 3) Department of Orthopaedic Surgery, Graduate School of Medicine Kyoto University, 4) Nagahama City Hospital

ance with the circumstances of each individual. In particular, if the walking state and the process of adaptation to daily living after discharge can be ascertained accurately, this would become a key document on how to provide patients with appropriate support.

II. Objective

The purpose is to clarify the actual walking situation; number of steps, walking duration, and activity energy expenditure (AEE) in THA patients during the discharge transition period (from three days prior to the day of discharge to two weeks after discharge).

III. Methods

1. Patients

Subjects were seven female patients who underwent primary, unilateral THA between July and December 2008 and whose activities were otherwise unrestricted.

2. Data collection

1) Patient attributes: age, body mass index (BMI), length of hospital stay

2) Number of steps, walking duration, and AEE: These data were measured using the Actical activity monitor (Mini Mitter Co., Bend, Ore, USA). The Actical activity monitor is a two-axis accelerometer (size: W27mm × H28mm × D10mm; sampling rate of 32 Hz and sensitivity 0.05 G) that calculates the number of steps, walking duration, and AEE. The monitor was attached to the belt in the lumbar region on the non-operated side. Data were collected 24 hours except when bathing. Measurement intervals were one minute.

3) Activities during walking: Using an activity diary, activities during monitoring (going out, rehabilitation, housework, other daily activities [sleeping, eating, using the toilet]) were recorded.

The data were collected from July until Decem-

ber 2008. The data period was divided into three sub-periods. The first period (pre-Dis), before actual discharge, comprises the three days prior to the day of discharge. The discharge first week (Dis 1) is the seven days following the discharge day. The discharge second week (Dis 2) is the seven days following the eighth day after discharge. Note that the actual day of discharge was excluded from data collection.

3. Data analysis

Taking into account the learning curve, measurements using the Actical activity monitor on the first day were excluded from analysis. Using Actical Software Ver.2.1, the mean and standard deviation values for number of steps, walking duration, and AEE were calculated for the entire measurement period (pre-Dis., Dis 1, Dis 2). Details of walking activity were extracted from activity diaries during walking.

4. Ethical considerations

This study was reviewed and approved by the ethics committee of the Graduate School of Medicine and the Faculty of Medicine at Kyoto University (E476. Informed consent was obtained by means of a signed written approval from the patient.)

IV. Results

1. Patient attributes

All patients were women, with a mean age of 65.3 ± 9.2 (51-76) years, BMI of 22.6 ± 1.6 (19.6-24.8) kg/m^2 . They were hospitalized for 32.9 ± 8.7 (23-48) days. Prior to hospitalization, one patient was working, but after discharge, all became full-time housewives.

2. Walking parameters

1) Number of steps (Table.1)

Analysis of the mean number of steps by period showed an increase over time in six patients, with the exception of patient E.

2) Walking duration (Table.1)

Table 1 Average walking state (steps/Walking duration/Activity energy expenditure:AEE) according to the period^a and case

case(age)	A (51)			B (57)			C (63)			D(65)		
	pre-Dis	Dis1	Dis2	pre-Dis	Dis1	Dis2	pre-Dis	Dis1	Dis2	pre-Dis	Dis1	Dis2
Steps (counts/day)	667.0	2592.7	3674.6	3407.0	6165.1	6411.1	4295.0	4463.7	6643.6	1947.5	2456.6	2722.0
SD	116.9	930.9	421.4	739.5	1340.8	1188.8	1025.5	2533.6	2537.9	313.2	779.1	651.4
walking duration	62.7	266.7	326.9	147.0	329.0	343.0	202.3	178.9	240.6	88.0	135.7	163.3
SD	16.5	61.9	35.6	22.5	56.3	43.0	16.9	82.4	71.4	18.0	18.9	36.0
AEE (kcal/day)	22.9	48.0	89.4	96.2	94.2	107.7	85.0	84.8	136.5	18.2	14.1	12.3
SD	4.0	37.2	16.3	19.6	26.3	37.0	29.4	52.9	45.3	6.1	7.1	6.2

case(age)	E (70)			F (75)			G (76)			mean of all		
	pre-Dis	Dis1	Dis2	pre-Dis	Dis1	Dis2	pre-Dis	Dis1	Dis2	pre-Dis	Dis1	Dis2
Steps (counts/day)	698.3	257.0	383.6	1028.0	2228.9	4415.7	1267.0	2447.1	2680.6	1899.1	2944.4	3847.3
SD	158.7	180.8	259.6	219.3	1119.2	925.3	205.3	389.6	493.8	1450.1	2111.2	2342.2
walking duration	54.3	32.0	48.7	61.7	176.7	311.6	85.0	211.9	226.1	100.1	190.1	237.2
SD	12.7	15.8	31.0	12.0	63.5	42.1	18.5	25.9	34.6	53.9	101.2	106.2
AEE (kcal/day)	7.3	6.1	18.0	9.4	3.4	21.0	39.9	74.6	94.1	40.9	46.5	68.4
SD	8.0	4.7	8.9	3.5	2.4	11.4	4.1	18.0	22.0	37.1	44.5	52.7

^a Accoding period means : a 3-day period until the day before discharge (pre-discharge: pre-Dis); a 7-day period from the day of discharge (discharge 1st week: Dis 1); and a 7-day period from discharge day 8 (discharge 2nd week: Dis 2).

The duration tended to increase after discharge compared to the duration at admission.

Moreover, walking duration after discharge was longer compared to duration during hospitalization.

In particular, in discharge week 2, walking duration in patient C was 240.6 ± 71.6 min, whereas in patient F, it was 311.6 ± 42.1 min, and in patient A, it was 326.9 ± 35.6 min. In contrast to the number of steps, walking duration was longer in patients F and A than in patient C.

3) Activity Energy Expenditure (AEE)

In the patients E, AEE was low throughout all periods, but it did increase from 0.0-15.9 kcal/day during hospitalization to 10.0~36.7 kcal/day after discharge (Table.1)

4) Activities during walking and mean numbers of steps per day (Fig.1)

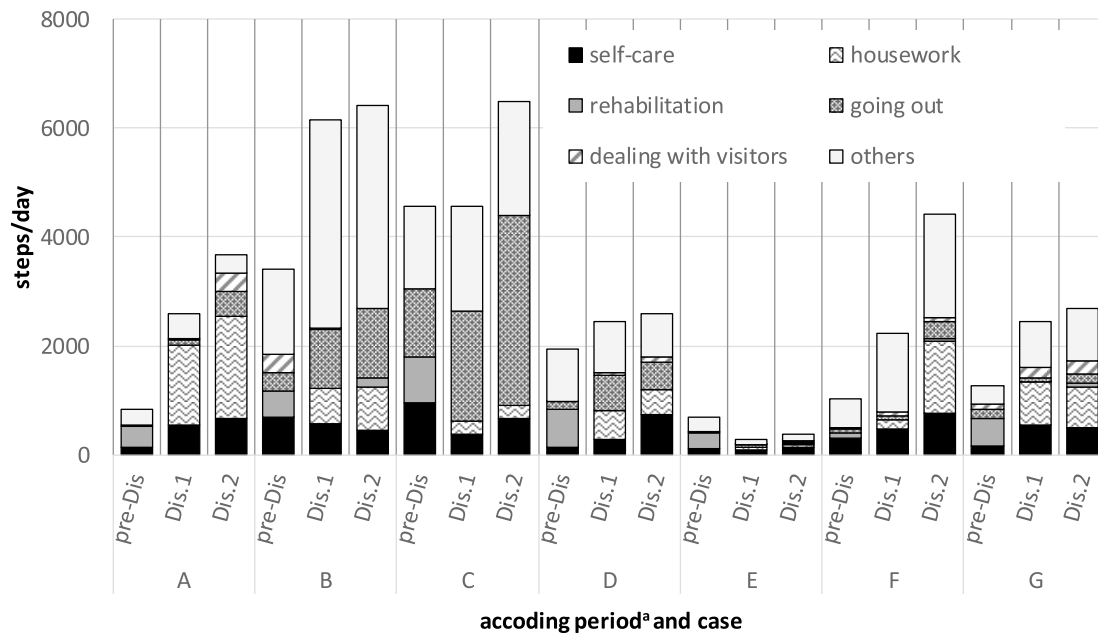
Walking activities during hospitalization were classified as rehabilitation for all patients. While some of the walking was part of the prescribed activities to be performed during hospitalization, some

of it was voluntary walking. There were more walking activities after discharge as there were opportunities for going out and doing housework, which did not exist prior to discharge.

V. Discussion

All seven patients activities and places where they could exercise were restricted during hospitalization. During this period, all patients were staying in the same environment and followed a similar schedule. However, despite these limitations, the actual level of activity varied, and largely depended on how each patient spent her time outside the hospital schedule. Although hospital facilities have spatial limitations that make walking long distances difficult, it is possible to perform activities effectively outside of rehabilitation if we prepare a walking program tailored to the specific circumstances of the individual patient.

After discharge, all patients had more opportunities for walking by going out and doing housework.



^a Accoding period means : a 3-day period until the day before discharge (pre-discharge: pre-Dis); a 7-dayperiod from the day of discharge (discharge 1st week: Dis 1); and a 7-day period from discharge day 8(discharge 2nd week: Dis 2).

Fig1 Activities of walking and mean numbers of steps per day according to the period^a and case

It was also observed that the walking situation for each patient was different. For example, the distance between a favorite shop and home, how they got there and the nature of their social ties, such as relationships with neighbors, led to individually different walking scenarios. Showalter et al. (1998) reported that there was a gap between patient expectations and what the patient can objectively achieve when starting to reintegrate into normal daily life after discharge. Therefore, just before discharge, the patient should be given appropriate advice and advised that as they can continue to participate in a walking rehabilitation program even if their walking situation has certain limitations.

In our seven patients, the number of steps during the discharge transition period, except in patient C of Dis2, was less than the mean number of steps adjusted for age (Ministry of Health, Labour and Welfare, Japan 2013), and did not reach the 8,500 steps required to maintain and improve health. It

shows, the patient that there is a need to address consciously improvement of walking for health improved after hospital discharge. However, during the discharge transition period, the number of steps and walking duration showed a tendency to increase in discharge week 2 compared to discharge week 1. In the preceding study, that examined the number of steps over a 1-month period, there was no significant difference in the number of steps take at the time of discharge and after discharge (Kobayashi T, et al., 1997). Although there are individual differences, it was observed in this study that the number of steps and walking duration increased over the two weeks comprising the hospital discharge transition period.

THA patients were reported to gain in confidence when they are able to live without problems (Akiba K, et al., 2007). Similarly the patients in this study were able to walk safely at home in the first week after discharge, which could lead to an expansion

of activities in of two subsequent weeks. However, AEE presented an aspect unlike steps and the walk duration. The patients who did not increase AEE, performed housework for a longer duration than the others while they also increased the number of steps they took and walking duration. The difference between housework and going out in terms of walking is walking duration and the distance required to perform these respective actions. Housework involves repetitive movements over short distances and with a shorter stride length. Therefore, AEE did not increase in comparison with the number of steps and walk duration. Zahiri et al. (1998) reported that patients had a tendency to overestimate their activity when compared to the actual number of steps. In this study also, it is possible that patients may have overestimated their indoor activities as they undertook walking exercise as part of their recuperation. From this viewpoint, it is necessary to consider not only the number of steps and walking duration but also the actual nature of the activities undertaken in everyday life when giving instructions to improve walking ability.

Patients who have undergone THA may feel concerned about their lifestyle and complications after discharge (Johansson K, et al., 2002). In addition, though they may understand the precautions regarding prohibited activities, they may not fully understand what kind of activities they are allowed to undertake.(Montin L, et al., 2002). Also, in the guidance provided regarding lifestyle in the immediate period following discharge, learning how to prevent hip dislocation is essential (Altizer L, 2004) ; however, adequate instruction on walking is lacking.

In THA patients, walking is recommended to maintain health and strengthen the muscles (Kuster MS, 2002). Assessment of walking is essential to predict complications such as wear of the artificial joint. Previous studies have focused on the num-

ber of steps. However, there have been virtually no studies that have accurately assessed both walking ability and walking quality after THA surgery. In addition, walking ability has usually been evaluated based on walking speed and stride length (Van den Akker-Scheek I, et al., 2007), however, none of these reflect walking in real life situations. There are cases where even though the number of steps is similar, walking duration or AEE is different. And it was found that for patients with frequent indoor activity, the number of steps and walking duration increased but AEE remained low, whereas in patients who actively went outdoors, AEE was high. These show that there is a limit to how well walking ability and quality can be assessed based on the number of steps alone.

VI. Conclusions

This study was conducted to evaluate walking in THA patients during the discharge transition period. The following are the main findings.

In the discharge transition period, lower extremity function was poor, and stable walking was not possible. In the seven patients, the number of steps was low compared to healthy age-adjusted persons. Changes in AEE were not necessarily correlated with the number of steps and walking duration. Number of steps, walking duration, and AEE enabled walking ability and quality to be evaluated; taken these measures are possible to grasp the walking status that reflects the activities.

Conflict of interest

The authors declare no conflict of interests.

References

- Akiba K, Fujinami K, Nishioka M, et al. (2007): Jinkoukan-setuzentikanjyutuwoukeru kanjyano syuusyujyutukiniokeru ihiki tyousa, Hip Joint, 33 Suppl, 16-18.(in Japanese)
- Altizer L (2004): Patient Education for Total Hip or Knee

- Replacement, *Orthopaedic Nursing*, 23(4), 283.
- Groot IB, Bussmann HJ, Verhaar JA (2008): Small Increase of Actual Physical Activity 6 Months after Total Hip or Knee Arthroplasty, *Clin Orthop Relat Res*, 466(9), 2201-2208.
- Japan Ministry of Health, Labour and Welfare (2013): National Health and Nutrition Survey, <http://www.mhlw.go.jp/dl/h25-houkoku-03.pdf>
- Johansson K, Hupli M, Sakanter S (2002): Patients' learning needs after hip arthroplasty, *Journal of Clinical Nursing*, 11, 634-639.
- Kobayashi T, Nagano K, Oi N, et al. (1997): Analysis of factors relating to the physical activities in patients following hip arthroplasty, *Journal of Physical Medicine*, 8(1), 9-21. (in Japanese)
- Kuster MS (2002): Exercise Recommendations After Total Joint Replacement A Review of the Current Literature and Proposal of Scientifically Based Guidelines, *Sports and Medicine*, 32(7), 433-445.
- Montin L, Suominen T, Kilpi HL (2002): The experiences of patients undergoing total hip replacement, *Journal of Orthopaedic Nursing*, 6, 23-29.
- Pablo P, Losina E, Phillips CB, et al. (2004): Determinants of Discharge Destination Following Elective Total Hip Replacement, *Arthritis & Rheumatism*, 4(15), 1009-1017.
- Stevens M, Wagenmakers R, Groothoff WG, et al. (2007): Physical activity behavior after total hip arthroplasty(THA) A prediction based on patient characteristics, *Patient Education and Counseling*, 69, 169-199.
- Showalter A, Burgar S, Salyer J (1998): Patients' and Their Spouses' Needs after Total Joint Arthroplasty: A Pilot Study, *Orthopaedic Nursing*, 19(1), 49-57.
- Van den Akker-Scheek I, Stevens M, Bulstr SK, et al. (2007): Recovery of Gait After Short-Stay Total Hip Arthroplasty, *Archives of Physical Medicine and Rehabilitation*, 88, 361-367.
- Wong J, Wong S, Brooks E, et al. (1999): Home readiness and recovery pattern after total hip replacement, *Journal of Orthopaedic Nursing*, 3, 210-219.
- Zahiri CA, Schmalzried TP, Szuszczewicz ES, et al. (1998): Assessing Activity in Joint Replacement Patients, *The Journal of Arthroplasty*, 13(8), 890-895.