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Is There Any Relationship between Total Hip Arthroplasty and Urinary Incontinent?

Mariko Asahi[1], Saiji Kondo[1], Atsushi Kusaba[1], Akihiko Maeda[2], Koji Kanzaki[2]

[1]Institute of Joint Replacement and Rheumatology, Zama General Hospital, Zama, Japan
[2]Department of Orthopedic Surgery, Showa University Fujigaoka Hospital, Yokohama, Japan
Email: ma1ri2ko2000@yahoo.co.jp

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Abstract

Introduction: In my daily practice as a hip surgeon, I have observed some circumstances where urinary incontinence (UI) improves after total hip arthroplasty (THA). We investigated UI symptoms before and after THA at our facility and considered the factors that influence UI. **Patients and Method:** The subjects were 113 female patients who underwent primary THA in our facility. An anterior lateral approach was used in all cases. Using the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF), we conducted an investigation into the presence of UI before and 2 weeks after THA. An improvement in UI was defined as a decrease of 1 point or more, a worsening is defined as an increase of 1 point or more. **Results:** The responses from the 113 subjects were analyzed. Of the 113 patients, prior to THA, UI was prevalent among 59 patients and was absent among 54 patients. In the group where UI was prevalent, it improved after THA in 50 patients (85%), remained unchanged in 5 (8%) and worsened in 4 (7%). In the group where UI was absent, 49 patients (91%) remained unchanged and UI appeared in 5 (9%). Compared with the non-prevalence group (62 patients), the prevalence group (50 patients) had a noticeable improvement rate of internal rotation of the surgical hip side ($P < 0.01$). **Conclusion:** UI greatly reduces the quality of life (QOL). In this study, there is a possibility that THA improves UI.

Keywords

Total Hip Arthroplasty, Urinary Incontinence, Obturator Internus

1. Introduction

The majority of Japanese osteoarthritis patients have secondary osteoarthritis

mainly due to congenital dislocation of the hip joint or acetabular dysplasia [1]. Hip joint disorders from osteoarthritis greatly reduce the quality of life (QOL), and QOL improves markedly within three months after total hip arthroplasty (THA) [2]. The prevalence of hip osteoarthritis is particularly high among middle-aged and elderly women [3]. The term lower urinary tract symptoms (LUTS) which was introduced in 1994, many adults experience, and the prevalence of these symptoms increases with age [4]. LUTS are highly prevalent in Japan, and few subjects seek treatment [5]. UI is significantly under-diagnosed, and many people suffer from life-disrupting consequences of a condition that is largely treatable [6]. Furthermore, it is expected that patients with hip osteoarthritis are hesitant to say they have LUTS symptoms to a hip surgeon. Although in such a situation, in daily practice as a hip surgeon, we have observed that there are some circumstances in which UI improves after THA. THA is a great option that relieves pain and improves mobility, and as a result, improves QOL. The improvement in symptoms is amazing for patients suffering from hip dysfunction and UI.

We acknowledge that Tamaki *et al.* [7] first submitted the information that patients with UI before THA improved by 64% 3 months after THA using the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF). Okumura *et al.* [3] reported that for patients with hip-joint disorder, hip-joint treatment could prove to also be a useful treatment for UI. Baba *et al.* [8] reported that symptoms of UI were significantly improved in anterior approach (AA) group and aggravated in the posterior approach (PA) group. In our institution, anterior lateral approach was adopted at the time of THA. We investigated whether UI improves after THA in our facility.

2. Methods

Information on the existence of UI and hip function limitations was collected on 113 female patients with an average age of 63.5 years. All patients had suffered from hip osteoarthritis and underwent primary THA in the period from July 2019 to December 2021. 11 of them were given simultaneous bilateral THA. All the arthroplasty procedures employed the anterolateral muscle-sparing approach in a 60-degree half-lateral position. No dislocation and no infection were reported in two weeks after THA. And patients were immediately followed by postoperative rehabilitation on the first day. Rehabilitation included both active and passive motion exercises on the affected joints. Patients were allowed to put their full weight on these joints. Prior to surgery and 2 weeks after, we requested all members of the group to fill out the ICIQ-SF.

An improvement of UI was defined as a decrease of 1 point or more, a worsening is defined as increase of 1 point or more. Range of movement (ROM) was measured before and after surgery, and the number of births, age, body mass index (BMI), intraoperative bleeding, and surgery time were listed. No patient received medication for UI. The Mann-Whitney U test was applied to evaluated difference, and the level of statistical significance applied was $P < 0.05$.

3. Results

3.1. Patient Background

Of the 113 patients, prior to THA, UI was prevalent among 59 (52%) patients (incontinent group) and was absent among 54 (48%) patients (continent group).

There was no significant difference in the number of births, age, body mass index (BMI), intraoperative bleeding, or surgery time.

Concerning ROM, there was no significant difference in flexion, abduction, adduction, external rotation, or internal rotation. However, there was a significant difference in extension ($P < 0.05$).

In the incontinent group, the symptoms of UI improved in 50 (85%) patients, remained unchanged in 5 (8%) and worsened in 4 (7%) after THA.

In the continent group, the symptoms of UI remained unapparent in 52 (96%) patients, and worsened in 2 (4%) (Table 1).

Among the 113 patients, the number of patients whose UI improved was 50 (group A), and whose UI remained unchanged or worsened was 63 (group B). Characteristics of the 2 groups are listed in Table 2. There were no significant differences in age, height, number of births, unilateral or bilateral THA. There were significant differences in weight and BMI ($P < 0.05$, $P < 0.01$ respectively). In response to the question, "when does urine leak?" for the patients who had UI symptoms before surgery, 44 (75%) replied "when coughing or sneezing" the most frequently (Figure 1).

Table 1. Changing of urinary incontinence after total hip arthroplasty.

	Total	Improvement	No change	Worsening
Incontinent group	59	50 (85%)	5 (8%)	4 (7%)
Continent group	54	-	52 (96%)	2 (4%)
Total	113	50	57	6

Table 2. Group A (improvement) 50 patients; Group B (no change + worsening) 63 patients; patients' back ground.

	Group A	Group B	P value
Age	64.6 ± 9.6	62.6 ± 10.4	0.34
Height	153.5 ± 6.1	153.9 ± 5.4	0.43
Weight	59.7 ± 11.1	55.7 ± 8.66	<0.05
BMI	25.5 ± 4.3	23.5 ± 3.6	<0.01
Number of births	1.8 ± 0.8	1.9 ± 1.0	0.38
Unilateral THA:bilateral THA	45:5	57:6	0.93

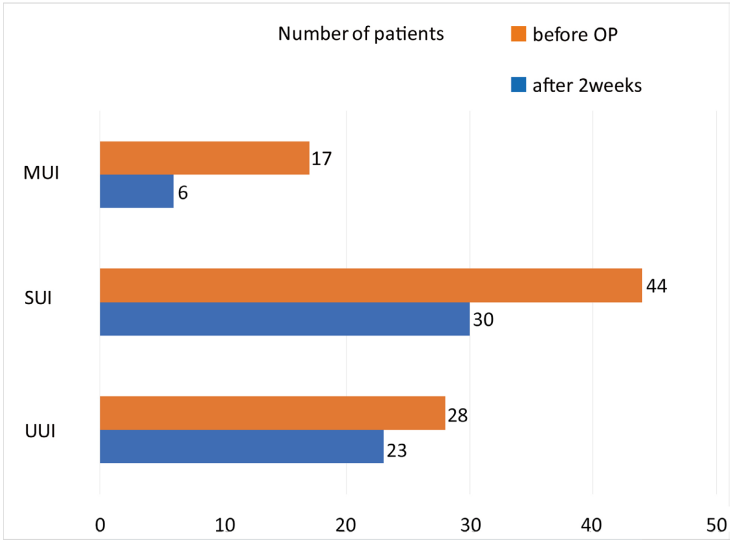

Figure 1. Response to the question, "when does urine leak?".

3.2. Evaluation of Hip Range of Movement

-Group A-

Flexion significantly improved from 85.5 ± 20.1 before THA to 91.6 ± 9.5 at 2 weeks after ($P < 0.05$).

Extension significantly improved from −3.4 ± 7.8 before to 0.6 ± 5.4 at 2 weeks after ($P < 0.01$).

Internal rotation significantly improved from 13.2 ± 12.9 before to 27.8 ± 11.9 at 2 weeks after ($P < 0.01$).

There was no significant difference in abduction, adduction, or external rotation (**Table 3**).

-Group B-

Extension significantly improved from −2.5 ± 7.9 before to 2.8 ± 6.2 at 2 weeks after ($P < 0.01$).

Abduction significantly improved from 13.3 ± 0.9 before to 15.9 ± 4.8 at 2 weeks after ($P < 0.01$).

Internal rotation significantly improved from 17.2 ± 15.9 before to 26.4 ± 11.3 at 2 weeks after ($P < 0.01$).

There was no significant difference in flexion, adduction, or external rotation (**Table 4**).

3.3. Comparison between Group A and Group B in Range of Movement

Improvement in ROM was compared between the 2 groups (**Figure 2**). Flexion, extension and internal rotation were significantly improved at 2 weeks after THA in group A. In group B, extension, abduction and internal rotation were significantly improved at 2 weeks after THA. The difference between unilateral and bilateral arthroplasty was compared, and there were no significant differences in terms ROM. We determined improvement rate by dividing the ROM

Table 3. Group A: Evaluation of hip ROM.

	Before	After 2 weeks	P value
Flexion	85.5 ± 20.1	91.6 ± 9.5	<0.05
Extension	−3.4 ± 7.8	0.6 ± 5.4	<0.01
Abduction	15.4 ± 8.1	16.3 ± 5.6	=0.20
Adduction	7.1 ± 5.4	6.9 ± 3.8	=0.82
External rotation	19.6 ± 9.6	18.1 ± 7.6	=0.16
Internal rotation	13.2 ± 12.9	27.8 ± 11.9	<0.01

Table 4. Group B: Evaluation of hip ROM.

	Before	After 2 weeks	P value
Flexion	86.5 ± 18.5	91.7 ± 8.5	=0.11
Extension	−2.5 ± 7.9	2.8 ± 6.2	<0.01
Abduction	13.3 ± 0.9	15.9 ± 4.8	<0.01
Adduction	5.8 ± 4.6	6.6 ± 2.9	=0.08
External rotation	20.3 ± 10.2	18.8 ± 9.1	=0.28
Internal rotation	17.2 ± 15.9	26.4 ± 11.3	<0.01

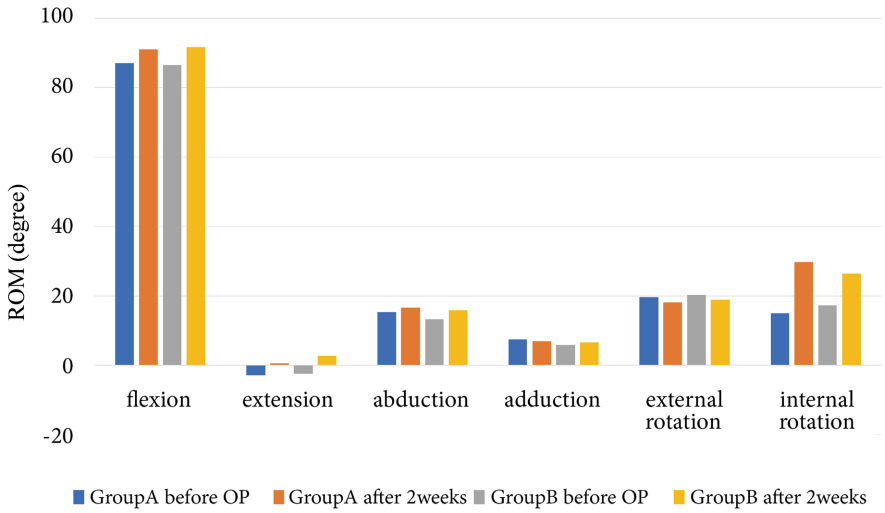

Figure 2. Comparison between group A and group B in ROM.

before THA by the ROM after 2 weeks THA. Using the improvement rate of ROM, statistically there was a significant difference between 2 groups, only in internal rotation ($P < 0.05$). Improvement rate of internal rotation was significantly higher in group A.

3.4. Case Presentation

The patient was a 55-year old woman who was suffering from right hip pain be-

cause of her osteoarthritis of the hip. According to her questionnaire before THA, she leaked a moderate amount of urine two or three times a week. And her leaking urine interfered with her life by level 4. Her Points of ICIQ-SF was 10 before THA. 2 weeks after the THA, she never leaked urine, and it interfered with her life by revel 1. Her point of ICIQ-SF was 1, 2 weeks after the THA (**Figure 3**).

4. Discussion

4.1. Prevalence of Urinary Incontinence

Kikuchi *et al*. [9] investigated the prevalence of UI using ICIQ-SF in 676 Japanese men and women aged > 70 years who were living in the Tsurugaya area of Sendai, one of the major cities in the Tohoku area of Japan. In the study, the prevalence of UI was 25% (34% in women and 16% in men), and the shown high physical activity level was independently related to a lower self-reported prevalence of UI in a community-dwelling elderly population aged > 70 years.

Tamaki *et al*. [7] reported the prevalence rate of UI in patients with hip osteoarthritis before THA was 43%, using ICIQ-SF.

Baba *et al*. [8] reported the prevalence rate of UI in patients with hip osteoarthritis before THA was 47% using ICIQ-SF.

Okumura *et al*. [3] reported the prevalence of UI in patients with hip osteoarthritis before THA was 67% using a core lower urinary tract symptom score (CLSS).

In our study, the prevalence of UI in patients with hip osteoarthritis before THA was 52%.

In the case of hip joint disorders, physical activity levels might be lower, and the prevalence of UI in patients with hip dysfunction may be higher than in people without hip dysfunction.

4.2. Type of Urinary Incontinence

Hannestad *et al*. [10] reported half of the incontinent women were experiencing symptoms of stress incontinence (SUI) alone, symptoms of urge incontinence (UUI) alone affected only one in ten, while mixed incontinence (MUI) was

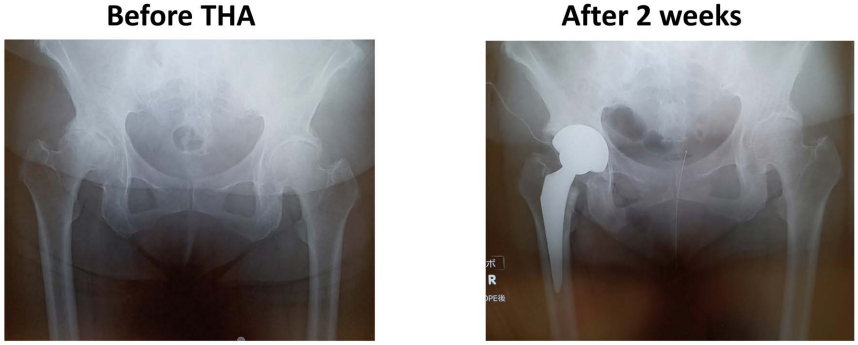

Figure 3. 55-year old patient whose UI improved after THA.

reported by one in three in 6501 of UI patients. In our study, stress incontinence was the most frequent. (**Figure 1**) Bo K reported that pelvic floor muscle training is effective in the treatment of female stress incontinence (SUI) and mixed urinary incontinence and therefore, it is recommended as a first-line therapy.

The stress continence system includes the sphincteric closure mechanism consisting of urethral striated muscle, urethral smooth muscle, and vascular elements and the remainder of the bladder support system consisting of the anterior vagina, endopelvic fascia, tendinous arch of levator ani, and bony pelvis [11]. The consequence of levator ani muscle damage might depend on which or how many elements have been damaged [12]. If the tendinous arch of levator ani falls, the ipsilateral side of the vagina falls, carrying with it the bladder and the urethra, and thus contributing to urinary incontinence. The tendinous arch of levator ani is at the bottom of the fascia obturator.

Tamaki *et al*. focused on the obturator internus muscle, which originates from the pelvic floor and has a close relationship with the levetorani muscle [7]. Okumura *et al* reported that THA is performed to improve hip-joint function and recovery of levator ani function that is connected to the obturator internus [3].

Baba *et al*. [8] reported that since the short external rotator may have been atrophied due to hip joint dysfunction before surgery, support of the pelvic organs and UI may be improved if the strength of this muscle group recovers. And, symptoms of UI were significantly improved in the anterior approach group without dissecting the short external rotators, and aggravated in the posterior approach group [8].

The superior gemellus, inferior gemellus, and obturator internus muscle have been regarded as a single muscle unit and called the "rotator triceps muscle" [13]. The gemelli converge onto the tendon of insertion of the obturator internus muscle and because the three muscles terminate at the same common bony attachment, the medial aspect of the greater trochanter [13]. Their functions are also common; they act synergistically to rotate the pelvis and/or femur [13]. The obturator internus muscle arise over a wide area of the lesser pelvis, converges to the lesser sciatic notch, changes its course, and is inserted into the medial aspect of the greater trochanter [13].

In our institution, all the arthroplasty procedures employ the anterolateral muscle-sparing approach in the 60-degree half lateral position. At the time of stem insertion, we may cut the conjoint tendon as little as possible if it is hard to insert the stem.

4.3. Improvement Rate of Urinary Incontinence

In our study, UI improved in 50 (85%) patients. In other studies, Tamaki *et al*. [7] reported the symptoms of UI ameliorated in 52 (64%) patients which was done by the muscle-sparing direct anterior approach using ICIQ-SF. Okumura *et al*. [3] reported in total, patients were better than improved (72%). The rate of cured and improved patients was 76%, for stress UI, 100% mixed UI, and 50%

urge UI. Baba *et al*. reported UI improved after THA in 8 patients (22%), slightly improved in one (2.8%) in the anterior approach group using the distal part of the Smith-Petersen approach. In the posterior approach group, by dissecting the short external rotators, UI improved after THA in one (2.5%). Patients with hip disorder have limited range of motion, and those muscles around hip reduce tension. In our study, improvement rate of internal rotation of group A (improvement of UI group) was high. Think about why UI improved after THA, and the internal rotation movement became possible after that, external rotators including the obturator internus are able to stretch, and preserve the original musculature. As a result, the obturator internus can exert tension. The obturator internus is closely related to the levator ani. In addition, thinking of the approach of THA which preserves the obturator internus, it could be advantageous for the improvement of UI.

Pelvic floor dysfunction is a common problem that leads to significant suffering among women [14]. Pelvic floor muscle training is effective in the treatment of female stress (SUI) and mixed urinary incontinence and, therefore, it is recommended as a first-line therapy [11]. Hip joint disorders from osteoarthritis and UI both greatly reduce the QOL. And both ages of onset are the same for middle age and older [7]. Tamaki *et al*. hypothesizes that a loose pelvic floor could be improved by THA [7]. In our study, 85% of the THA patients' UI improved just 2 weeks after THA. That suggests THA might have the same effect as pelvic floor muscle training and might be more immediately effective than muscle training.

5. Limitations

This study had some limitation. Firstly, because the study was only two weeks, the long-term results are unclear. Secondly, a pain scale wasn't used; therefore the patients' pain levels were unknown.

Thirdly, only orthopedic doctors got involved in this study, no urologists were involved.

Fourthly, the number of patients studied was low. Finally, the anterior and posterior THA approaches were not compared.

6. Conclusion

In conclusion, UI doesn't affect a patient's life span; however, it affects their QOL later in the future. Our study has shown that THA can be beneficial for treating UI. We would like to continue this study more using X-rays to consider how patients' femoral offset changes after THA.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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