



ORIGINAL ARTICLE

Hip dysfunction-related urinary incontinence and total hip arthroplasty with the direct lateral approach

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Abstract

Objectives: There is a functional relationship between the hip joint and the pelvic floor muscles. In patients with secondary osteoarthritis of the hip, urinary incontinence is also seen. Research has shown that total hip arthroplasty (THA) surgery improves the symptoms of urinary incontinence. This prospective cross-sectional study without a control group was performed on THA candidates with urinary incontinence and secondary osteoarthritis with the aim of investigating the effect of THA with a direct lateral approach and subsequent routine physiotherapy on the symptoms of urinary incontinence.

Methods: Sampling was performed using a simple method among those referred to orthopedic clinics in the private sector. Data were collected in all patients before and 3 months after THA using demographic, International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and hip range of motion record tables. The results are presented as mean with standard deviation.

Results: In this study, 16 men with a mean age of 76.75 years (± 4.65) and 8 women with a mean age of 72.75 years (± 7.32) participated. Before THA, stress urinary incontinence (54.16%) and urgency urinary incontinence (20.83%) had the highest frequency. However, after THA, the frequency of stress and urgency urinary incontinence decreased (16.66% and 8.33%, respectively). According to the results of the ICIQ, complete improvement of urinary incontinence symptoms was observed in up to 62.5% of the subjects. After THA, there was a significant difference between the mean total score obtained from the WOMAC questionnaire compared to before surgery. There was a significant improvement in the range of motion of the hip joint in all directions.

Conclusions: THA and routine hip physiotherapy in patients with urinary incontinence and secondary hip osteoarthritis have a significant positive effect on improving symptoms of urinary incontinence and hip function. In addition, it significantly improves the ICIQ and WOMAC questionnaire scores.

KEYWORDS

International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF), total hip arthroplasty, urinary incontinence, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)

1 | INTRODUCTION

In 1998, the World Health Organization declared urinary incontinence a disease to increase public awareness of this complication.¹ According to the reports from the International Consultation on Incontinence, urinary incontinence refers to any involuntary leakage of urine.² The highest frequencies of urinary incontinence were found in stress urinary incontinence (SUI), urgency urinary incontinence (UUI), and mixed urinary incontinence (MUI), respectively. Urine leakage in SUI is caused by increased intra-abdominal pressure (coughing, sneezing, laughing, etc.) as well as during physical activities (running, jumping, and lifting objects). In UUI, a person suddenly feels the urge to urinate. MUI is a combination of SUI and UUI. Factors such as genetics; aging; female sex; marriage; obesity; alcohol; cigarette smoking; some mental, cognitive, and functional disorders; and surgeries are risk factors for urinary incontinence. Urinary incontinence is an embarrassing condition that causes anxiety during social and professional activities. Urinary incontinence affects a person's quality of life according to the severity of the symptoms.^{3,4}

Osteoarthritis disease is the most common musculoskeletal disease, caused by various changes in physiology, biomechanics, and biochemistry of joint cartilage.^{5,6} Epidemiologically, osteoarthritis is the most common rheumatic disease and increases with age. Etiologically, the underlying cause of osteoarthritis is still unknown, but a number of local and systemic risk factors are associated with osteoarthritis. From a pathological point of view, osteoarthritis causes the destruction of articular cartilage and the formation of osteophytes and sclerosis of subcutaneous bone. Osteoarthritis is divided into a primary and a secondary type.⁵ In the case of primary osteoarthritis, the cause of the disease is unknown or hereditary, and the joint is damaged for the first time; in the case of secondary osteoarthritis, the cause of the disease is known. Factors such as genetics (primary disease); trauma; congenital defects; inflammatory joint disease; and endocrine, metabolic, and neuropathic factors cause secondary osteoarthritis.^{5,6}

Any procedure for joint reconstruction to reduce pain, improve function, or restore joint movement is called arthroplasty. Total hip arthroplasty (THA) is considered the last resort for the treatment of advanced osteoarthritis. There are several approaches to hip replacement surgery, the three most common of which are the posterolateral approach, the direct lateral approach, and the anterolateral approach. It seems that the use of any of these methods depends on the choice of the treating physician.^{7,8}

The morphology as well as the pattern of denervation in the external rotator cuff muscles of the hip joint (internal obturator, gemellus and quadratus femoris) show that these muscles act as a single mass, and there is a functional relationship between these muscles and the pelvic floor muscles.⁹ On the other hand, many researchers have anatomically reported that iliococcygeus and levator ani, which support muscles on the pelvic floor, are associated with the internal obturator muscle through pelvic fasciitis, thus affecting each other's function. It seems that the misalignment of these muscles in patients with secondary osteoarthritis of the hip joint is the cause of the prevalence of urinary incontinence in these patients.^{10,11} In addition, in

people with a history of hip osteoarthritis, the muscles around this joint, including the external rotator cuff muscles, are less mobile, and due to the reduced range of motion of the joint, the tension of these muscles decreases compared to healthy people. Studies have shown that improvements in hip function can cause changes in the symptoms of urinary incontinence in people with secondary femoral osteoarthritis who have undergone THA surgery. The rate of improvement in postoperative urinary incontinence symptoms was significantly higher with the anterior approach than with the posterior approach.¹²⁻¹⁴

The most common approach in Iran is the direct lateral approach; thus, the aim of this study was to investigate the effect of THA with direct lateral approach and subsequent routine hip physiotherapy on urinary incontinence symptoms in patients with secondary osteoarthritis who also have urinary incontinence.

2 | METHODS

The ethics committee of the Iran University of Medical Sciences (IUMS) approved the study protocol (IR.IUMS.REC.1398.1168). In this cross-sectional prospective study, all patients had level 3 or 4 secondary osteoarthritis, and all patients had undergone unilateral THA surgery. All participants were asked to sign informed consent forms after they had been provided with details of the study protocol. Sampling was performed by a simple (available) method among those referred to orthopedic clinics in the private sector. Inclusion criteria were co-occurrence of urinary incontinence and secondary osteoarthritis in patients over 60 years of age who were THA candidates without a history of urinary physiotherapy during the past 3 months. Exclusion criteria were severe functional and structural abnormalities in the pelvic floor and the relevant structures (such as traumatic injuries to the pelvic area, congenital dislocation of the hip, developmental dysplasia of the hip, history of hip dislocation, myopathy, benign prostatic hyperplasia, urinary tract infection, and pelvic organ prolapse), primary osteoarthritis, any treatment related to urinary incontinence before and during the study, and patient withdrawal from the study. Demographic information (such as height, weight, age, and gender), the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and hip range of motion record tables were used to collect data.

The ICIQ-SF was used to assess the prevalence, severity, and type of urinary incontinence and its effect on the quality of life. This questionnaire consists of six questions. Questions 3, 4, and 6 have subsections that measure the frequency, severity, and type of urinary incontinence, respectively. The third question has five points, and the fourth question has six points. The fifth question is about quality of life in the form of a visual analog scale with a score between zero and ten. The total score obtained from the ICIQ is between 0 and 21. A score of zero indicates the absence of urinary incontinence, and a score greater than or equal to one indicates the presence of urinary incontinence. The validity and reliability of the ICIQ-SF were assessed by Haji Ebrahimi in 2012.¹⁵

The WOMAC questionnaire was used to assess the hip joint. This questionnaire contains three criteria of joint dryness and clinical signs (7 questions), pain (9 questions), and physical function (17 questions). There are five options for each question (from zero to four). With the increasing severity of symptoms and problems, the patient is given a higher score on the questions. The raw score of each part is obtained from the sum of the scores of the questions. Then the raw score is converted from 0 to 100 in a formula. A higher score indicates that the patient has fewer problems. The validity and reliability of the WOMAC questionnaire have been reviewed and confirmed.¹⁶

To measure hip range of motion in the sagittal, frontal, and transverse plane, a manual goniometer was used, and the results were recorded in the designed table.

After hospitalization of patients for THA operation and before surgery, patients' urinary incontinence was assessed and confirmed using the ICIQ-SF. The severity, type, and frequency of urinary incontinence and its effect on the quality of life were determined. The hip was then assessed for joint stiffness, pain, and daily function using the WOMAC questionnaire, and hip range of motion was measured. The surgery was performed using the direct lateral approach in all patients, and after the operation, the patients underwent routine hip physiotherapy (without urinary incontinence physiotherapy). Patients were asked to continue hip exercises at home after discharge. Three months later, the above assessments were repeated.

With a confidence interval of 95% and study power of 80%, the required sample was 24 patients. The sample size calculation was based on the study by Baba et al., in which 13 out of 36 patients with anterior approach and 9 out of 40 patients with posterior approach had urinary incontinence.¹⁴ In this study, the results are presented as

average with standard deviation. Data were analyzed by SPSS using the paired *t* test. *p* < 0.05 was considered significant.

3 | RESULTS

In this cross-sectional study, 24 patients with secondary osteoarthritis and urinary incontinence were evaluated before and after THA. This study was performed on 16 men with a mean age of 76.75 (4.65) years and weight of 75.50 (6.14) kg and 8 women with a mean age of 72.75 (7.32) years and weight of 66.50 (5.76) kg. According to the results of this study (Table 1), SUI following coughing, sneezing, and physical activity (54.16%) and UUI (20.83%) occurred most frequently before THA surgery.

After THA, the frequency of SUI and UUI decreased (16.66% and 8.33%, respectively). According to the results of the ICIQ-SF after THA, complete improvement in urinary incontinence symptoms was seen in up to 62.5% of the subjects.

After THA, there was a significant difference between the mean total score obtained from the WOMAC questionnaire (81.29 ± 6.16) compared to before THA (61.42 ± 10.46). Based on the scoring of this questionnaire, obtaining a higher number indicates that there are fewer problems in the hip joint.

Table 2 shows the raw values obtained from the subsets of the WOMAC questionnaire. As can be seen in Table 2, pain, stiffness of the joint, and physical function of the hip improved significantly compared to before THA.

In Table 3, the mean values of hip ranges of motion before and after THA are given. Based on these results, a significant improvement

TABLE 1 Results from the ICIQ in patients with urinary incontinence and secondary osteoarthritis after THA

| Kind of UI | Number | | Mean of frequency | | | Mean of severity | | | Mean of QOL | | | Mean of total score | | |
|---------------------|------------|-----------|-------------------|-----------|----------------|------------------|-----------|----------------|-------------|-----------|----------------|---------------------|-----------|----------------|
| | Before THA | After THA | Before THA | After THA | <i>p</i> value | Before THA | After THA | <i>p</i> value | Before THA | After THA | <i>p</i> value | Before THA | After THA | <i>p</i> value |
| SUI | 13 | 4 | 2.07 | 1.00 | 0.001 | 1.84 | 0.75 | 0.001 | 4.23 | 2.75 | 0.001 | 8.15 | 4.50 | 0.001 |
| UUI | 5 | 2 | 2.00 | 1.00 | 0.001 | 2.20 | 1.00 | 0.001 | 4.20 | 4.00 | 0.001 | 8.40 | 6.00 | 0.001 |
| Others ^a | 6 | 3 | 2.33 | 1.66 | 0.001 | 1.50 | 1.00 | 0.001 | 4.33 | 4.00 | 0.001 | 8.16 | 6.66 | 0.001 |
| Never | 0 | 15 | 0.00 | 0.00 | 0.001 | 0.00 | 0.00 | 0.001 | 0.00 | 0.00 | 0.001 | 0.00 | 0.00 | 0.001 |
| Total | 24 | 24 | 2.12 | 0.45 | 0.001 | 1.83 | 0.33 | 0.001 | 4.25 | 1.70 | 0.001 | 8.20 | 2.50 | 0.001 |

Abbreviations: ICIQ, International Consultation on Incontinence Questionnaire; QOL, quality of life; SUI, stress urinary incontinence; THA, total hip arthroplasty; UI, urinary incontinence; UUI, urgency urinary incontinence.

^aNocturia; after urination; without reason; always.

TABLE 2 Hip evaluation using the WOMAC questionnaire before and after THA in patients with urinary incontinence and secondary osteoarthritis

| Variables | Before THA (mean ± SD) | After THA (mean ± SD) | <i>p</i> value |
|-------------------|------------------------|-----------------------|----------------|
| Pain | 17 (± 5.07) | 8.41 (± 3.30) | 0.001 |
| Stiffness | 13.50 (± 4.24) | 6.70 (± 3.43) | 0.001 |
| Physical function | 34.29 (± 9.75) | 16.25 (± 6.16) | 0.001 |

Abbreviations: THA, total hip arthroplasty; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index.

| Hip range of motion | Before THA (mean ± SD) | After THA (mean ± SD) | p value |
|---------------------|------------------------|-----------------------|---------|
| Flexion | 64.16 (± 9.28) | 71.25 (± 8.99) | 0.001 |
| Extension | 14.79 (± 4.29) | 18.12 (± 3.55) | 0.001 |
| Abduction | 25 (± 4.17) | 29.58 (± 4.14) | 0.001 |
| Adduction | 17.29 (± 4.65) | 20 (± 3.90) | 0.001 |
| External rotation | 25 (± 5.51) | 30 (± 5.51) | 0.001 |
| Internal rotation | 21.04 (± 5.31) | 24.37 (± 4.73) | 0.001 |

Abbreviation: THA, total hip arthroplasty.

was seen in the range of motion of the hip joint in the sagittal, frontal, and transverse plane.

4 | DISCUSSION

Based on the results of this study, a significant reduction in the symptoms of urinary incontinence was seen in people with urinary incontinence and secondary osteoarthritis who underwent hip replacement surgery with a direct lateral approach and routine hip physiotherapy. Also, there was a statistically significant difference between the quality of life and the total score of the ICIQ-SF of patients before and after THA.

In the study of Okumura et al., after THA with the anterior approach, the rate of improvement of urinary incontinence symptoms in SUI was up to 76%, in MUI up to 100%, and in UUI up to 50%.¹² Tamaki et al. also used only the anterior approach to replace the hip joint and reported up to 64% improvement in urinary incontinence symptoms after THA surgery.¹³ Baba et al. investigated the effect of both anterior and posterior approaches on urinary incontinence.¹⁴ According to their results, 56% exacerbation of incontinence symptoms and 11% improvement were seen in the posterior approach, while the rate of recovery was 69% in the anterior approach and none of the patients had exacerbation of symptoms. In justifying their results, they stated that due to the incision in the tendon of the lateral rotating muscles (medial obturator, regenerator, and quadratus femoris) in achieving a posterior approach to the joint, the relationship between these muscles and pelvic floor muscles through fascia was impaired. Therefore, the rate of improvement in urinary incontinence symptoms was lower with the posterior approach than with the anterior approach. With the anterior approach, the tendon of the external rotating muscles is not cut, and due to the improved length and tension of the muscles after THA, the recovery rate for urinary incontinence symptoms is higher.¹⁴ In the present study, the direct lateral approach was used for THA, and almost complete recovery was observed (62.5%), which is close to the results of the anterior approach in previous studies. In the direct lateral approach, incisions are made in the abductor muscles to access the joint; therefore the tendons of the external rotating muscles remain intact. In the anterior approach, incisions are made outside the tensor fasciae latae muscle, and one-third of the anterior muscles of the gluteus medius and gluteus minimus and the tendons of the external rotating muscles of the hip joint remain intact. It seems that the improvement in the

TABLE 3 Evaluation of hip range of motion before and 3 months after THA in patients with urinary incontinence and secondary osteoarthritis

symptoms of urinary incontinence with the anterior approach and lateral approaches (present study) compared with the results of Baba et al. (posterior approach) can be due to the fact that the external rotator cuff tendon was not damaged, the length and tension of these muscles were improved after THA, and the connection between these muscles and the pelvic floor muscles through the fascia was maintained.

In Baba and Tamaki's studies, the type of urinary incontinence was not mentioned,^{13,14} but in Okumura et al., 45% of patients had SUI, 35% had MUI, and 20% had UUI.¹² The improvement rate in the research of Okumura et al. was up to 75% in SUI and up to 50% in UUI. All patients with MUI showed complete recovery.¹² In the present study, approximately half of the patients suffered from SUI and a quarter from UUI, with a recovery rate of up to 70% in SUI and up to 60% in UUI (Table 1). Thus, it seems that the effect of the type of approach on the improvement of urinary incontinence symptoms is not dependent on the type of incontinence.

Also, there was a significant difference in pain, joint stiffness, and physical function in the assessment before and after THA, which was in line with the results of Okumura et al.¹² (Table 2). In addition, the range of motion of the hip joint in the three plates of movement was statistically significant, and the rate of improvement and increase in range of motion in all three plates was almost the same, which is consistent with the results of Okumura et al.¹²

Considering that in all studies, including the present study, routine hip physiotherapy following THA has been used, it can be concluded that if the focus of physiotherapy is on restoring the function of damaged muscles along with hip physiotherapy, more reliable results can be obtained. In general, it can be concluded that both the anterior and lateral approaches in THA and subsequent routine hip physiotherapy improve the symptoms of urinary incontinence in patients with secondary osteoarthritis of the hip.

It is suggested to study the effect of concurrent pelvic floor physiotherapy before and after THA along with routine hip physiotherapy on improving the symptoms of hip dysfunction-related urinary incontinence. It is recommended to study the effect of increasing the number of physiotherapy sessions with an emphasis on strengthening muscles.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Research data are not shared.

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