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Change of Symptoms after Total Hip Arthroplasty in Patients with Hip-Spine Syndrome

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Purpose: Elderly patients with degenerative diseases undergo treatment for the hip and spine; these patients present with various symptoms. This study focused on patients with residual symptoms, predominantly pain, even after receiving treatment for their spinal lesions.
Materials and Methods: Patients who underwent total hip arthroplasty (THA) between 2016 and 2022 at a single tertiary hospital were included in the study. Of the 417 patients who underwent primary THA, a retrospective review of 40 patients with previous lesions of the spine was conducted. Patients were stratified to two cohorts: Patients with symptoms related to the spine (Group A), and those with hip-related symptoms (Group B). Pre- and postoperative comparisons of groups A and B were performed.
Results: Improvements in patients' symptoms were observed in groups A and B after THA. In Group A, the mean preoperative visual analog scale (VAS) score was 5.10±0.876, which showed a postoperative decrease to 2.70±1.767. In Group B, the mean preoperative VAS score was 5.10±1.539, which showed a postoperative decrease to 2.67±1.493.
Conclusion: According to the findings, promising results were achieved with THA in treatment of debilitating diseases of the hip for both the prognosis of the disease, as well as the patients' symptoms. In addition, in some cases elderly patients with dual pathologies underwent treatment for spinal lesions without performance of any evaluation related to the hip. Thus, evaluation of a patient's hip must be performed and performance of THA in patients with symptoms even after treatment of spinal lesions is recommended.

Key Words: Hip, Spine, Total hip arthroplasty

INTRODUCTION

Patients present to clinics with symptoms that might be associated with a wide variety of hip-related pathologies. Pain is usually the most common presenting complaint among these patients. Buckland et al.[1] observed the following distribution of hip pain among patients with hip-related pathologies: 92% of patients presented with groin pain, 59% of patients presented with lateral hip pain, 52% of patients presented with anterior thigh/knee pain, and 38% of patients presented with buttock pain[1,2].

Many patients present with co-existing dual pathologies involving the hip and lumbar spine. Patient complaints at presentation include pain, tingling sensations, and senso-

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ry loss to their lower back, groin, thigh, knee, lower leg, and foot pain[1]. In this study, we focused on conditions related to the spine (e.g., lumbar spinal stenosis, spondylolisthesis, and herniated nucleus pulposus) and hip (e.g., osteoarthritis, avascular necrosis). Pain can be localized to specific lesions with specific characteristics, although crossovers may exist. Therefore, physicians must ensure that their diagnoses correlate with imaging or scoring systems[3].

Hip-spine syndrome, first described by Offierski and MacNab[4] in 1983, has been well-studied. However, hip-spine syndromes remain the focus of ongoing research to determine the effect of this condition on degeneration of the native hip-joint[5,6]. Previous studies have reported that patients with back pain show less favorable outcomes following treatment for hip pathologies[7,8]. Nevertheless, recent studies have demonstrated that successful resolution of back pain can be achieved after treatment of hip disease in patients who have undergone total hip arthroplasty (THA), or arthroscopic surgery for labral tears[7,8]. The purpose of our study was to compare functional and symptomatic scores for patients with residual symptoms after treatment related to the spine, after primary THA[7,9].

MATERIALS AND METHODS

1. Patient Selection

The design of this study was approved by the Institutional Review Board (IRB) of Dankook University Hospital (IRB No. 2023-02-010), and the written informed consent was waived by the IRB due to the retrospective nature of this study. A retrospective review of data from patients aged >60 years, who underwent THA between 2016 and 2022 at Dankook University Hospital was conducted using an electronic medical data recording program. Among 417 patients who were identified, 27 patients (6.5%) had undergone a revision procedure, 132 patients (31.7%) had undergone THA for treatment of fractures of the hip, and 218 patients (52.3%) with no history of treatment for spinal lesions were excluded from the study (Fig. 1). Ultimately, 40 patients with a history of treatment for spinal lesions before THA were included in the study. The patient population consisted of 15 males (37.5%) and 25 females (62.5%) with a mean age of 74.8 years (range, 62-87 years), and the mean follow-up period was 16.5±9.16 months.

The patients were divided into two groups according to the presenting signs and symptoms: (1) patients with spine-related symptoms with radiating pain and tingling sensa-

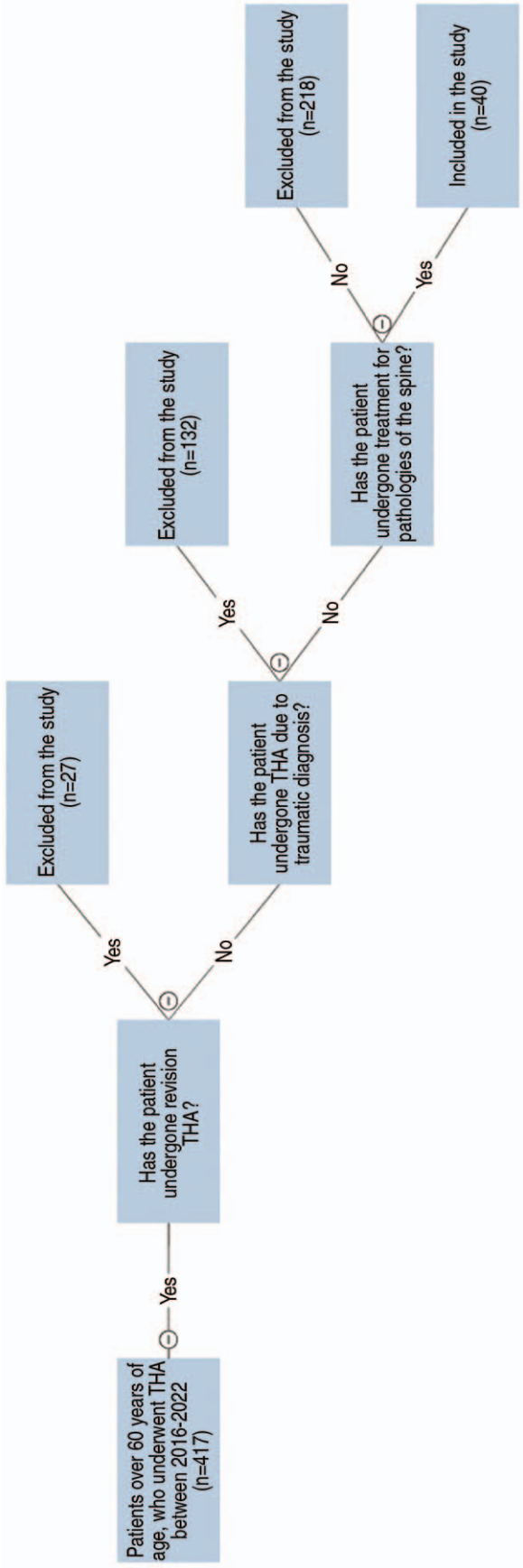

Fig. 1. Inclusion and exclusion criteria for patients in the study.
THA: total hip arthroplasty.

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Table 1. Two Groups Divided Based on the Character of the Pain

	Symptom	Sign
Group A (related to the spine)	Low back pain Radiating pain of L/Ext Tingling sensation of L/Ext Paresthesia	Claudication (L/Ext weakness) Positive SLR test
Group B (related to the hip)	Pain with ROM of the hip joint Tenderness on inguinal area	Positive sign on Patrick test

Group A: patients with symptoms related to the spine, Group B: patients with hip-related symptoms.
L/Ext: lower extremity, SLR: straight leg raise, ROM: range of motion.

Table 2. Categories of Ambulatory Performance Classified by Koval

Ambulatory ability	Score
Independent community ambulatory	7
Community ambulatory with cane	6
Community ambulatory with walker	5
Independent household ambulatory	4
Household ambulatory with cane	3
Household ambulatory with walker	2
Nonfunctional ambulator	1

tions in the lower extremities, lower back pain, and claudication were defined as Group A, and (2) patients with hip-related symptoms with pain typically localized to the hip joint that showed worsening with motion, and those with a positive sign on the Patrick test were defined as Group B[10,11] (Table 1). Comparisons of the pre- and postoperative visual analog scale (VAS) for pain and the modified Harris hip score (MHHS) were performed for assessment of patients' activity. Postoperative VAS score and MHHS were determined at six months postoperatively. In addition, the pre- and postoperative Koval scores were determined for all patients for assessment of their ambulation performance. The patients were divided into seven groups according to Koval score: (1) nonfunctional ambulatory; (2) household ambulatory with a walker; (3) household ambulatory with a cane; (4) independent household ambulatory; (5) community ambulatory with a walker; (6) community ambulatory with a cane, and (7) independent community ambulatory[12] (Table 2).

2. Surgical Technique

All surgical procedures were performed by the senior author. Once the patient had been placed in lateral decubitus position, a posterolateral approach was used. The incision was made along the intertrochanteric crest, and the piriformis and short external rotator muscles were then divided and retracted (Fig. 2). The femoral neck was cut, and the prosthesis was then inserted.

3. Statistical Analysis

Analysis of differences in the demographic parameters of the two groups was performed using the chi-square test. The Wilcoxon signed-rank test was used for comparison of pre- and postoperative VAS scores. All statistical analyses were performed using SPSS 25.0 Statistics (IBM Co.). Statistical significance was established at $P<0.05$.

RESULTS

The study population consisted of 15 males (37.5%) and 25 females (62.5%) with a mean age of 74.8 years (range, 62-87 years). Ten patients (25.0%) were assigned to Group A, and 30 patients (75.0%) were assigned to Group B. Among the 12 patients with degenerative disease of the lumbar spine who underwent spinal surgeries, two out of four patients (50.0%) in Group A showed improvement of symptoms, and all eight patients (100%) in Group B showed improvement after THA. Among the 28 patients with degenerative disease of the lumbar spine who were treated without lumbar spinal fusion, four out of six patients (66.7%) in Group A showed improvement of their symptoms, and all 22 patients (100%) in Group B showed improvement after THA.

Among the 13 patients with a Koval score $\geq$4, four out of six patients (66.7%) in Group A and all seven patients (100%) in Group B showed improvement. Among patients with a Koval score <4, eight out of 14 patients (57.1%) in Group A, and 11 out of 13 (84.6%) patients in Group B showed improvement.

Regarding prior diagnoses related to the hip, among the

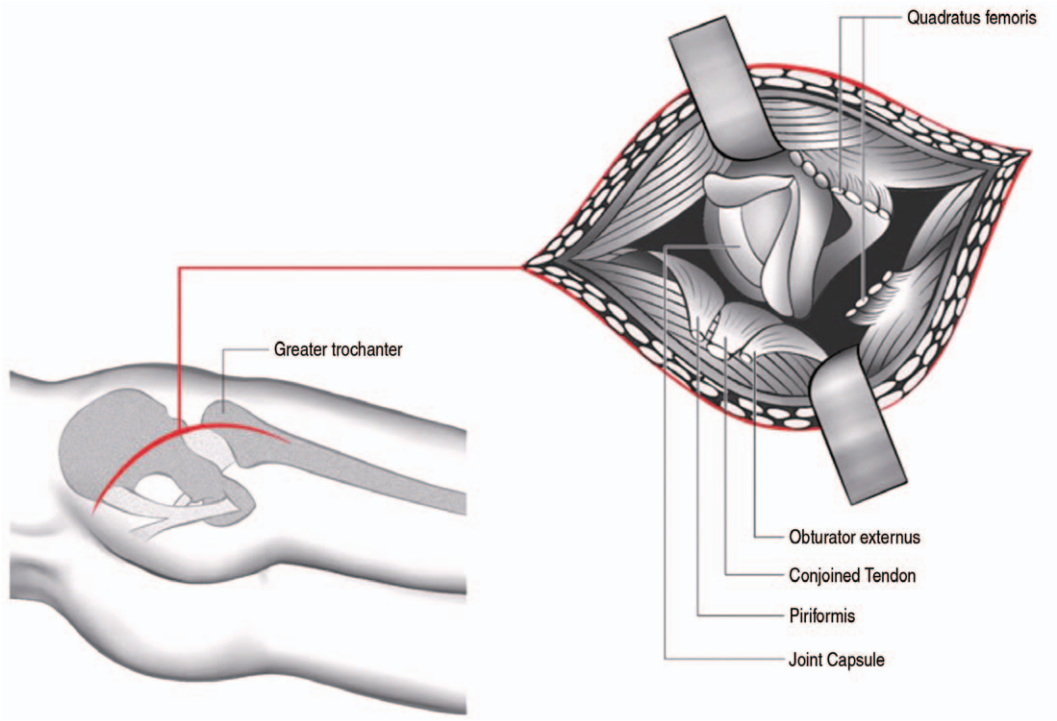

Fig. 2. Posterolateral approach for total hip arthroplasty.

Table 3. Pre- and Postoperative VAS between Groups A and B

	VAS score		*P*-value
	Preoperative	Postoperative	
Group A	5.10±0.876	2.70±1.767	<0.05
Group B	5.10±1.539	2.67±1.493	<0.05

Values are presented as mean±standard deviation.
P<0.05 was considered significant.
Group A: patients with symptoms related to the spine, Group B: patients with hip-related symptoms.
VAS: visual analog scale.

Table 4. Pre- and Postoperative Koval Score

	Preoperative	Postoperative	*P*-value
Group A	2.80±1.814	3.20±1.619	<0.05
Group B	2.00±1.700	2.89±2.233	<0.05

Values are presented as mean±standard deviation.
P<0.05 was considered significant.
Group A: patients with symptoms related to the spine, Group B: patients with hip-related symptoms.

26 patients with OA, four out of six patients (66.7%) in Group A and all 20 patients (100%) in Group B showed improvement after THA.

Among the 14 patients with AVN, four out of six patients (66.7%) in Group A and all eight patients (100%) in Group B showed improvement of their symptoms.

In Group A, the mean preoperative VAS score was 5.10 ±0.876, which showed postoperative improvement to 2.70±1.767 (*P*<0.05). In Group B, the mean preoperative VAS score was 5.10±1.539, which showed postoperative improvement to 2.67±1.493 (*P*<0.05) (Table 3). In addition, an improved postoperative Koval score was observed

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in both groups (P<0.05) (Table 4). The MHHS, which represents patients' activity of daily living, also improved from preoperative 47.2±14.99 to postoperative 59.9±16.97 (P<0.05).

In some cases, diagnosis related to the patient's hip had been neglected. A 70-year-old male, who had undergone posterior lumbar interbody fusion of L3-L4 spine at a local clinic, visited the out clinic (Fig. 3A). The patient suffered from pain in the right hip, and radiating pain from right buttock to posterior thigh, even after surgery. Based on radiographic imaging, the patient received a diagnosis of osteoarthritis of the right hip (Fig. 3B, C). The patient underwent THA, and his symptoms were relieved, and he was able to walk using a cane (Fig. 3D).

A 67-year-old male, who had undergone OLIF (oblique lumbar interbody fusion) surgery in the neurosurgery department of our hospital, visited our clinic with residual pain in both inguinal areas (Fig. 4A, B). Following imaging study, the patient received a diagnosis of progressed avascular necrosis of both femoral heads (Fig. 4C, D). The patient's symptoms were relieved after THA, and he was able to walk on his own without mechanical support (Fig. 4E).

DISCUSSION

Elderly patients may present with co-existing lumbar spinal stenosis and degenerative lesions of the hip joint; therefore, detailed history taking, physical examinations, and radiologic evaluations are required[1,2]. Buckland et al.[1] reported on the difficulty of differential diagnosis of pathologies related to the hip and spine; however, prevention of inappropriate and costly treatment resulting from incorrect diagnosis of the primary source of pain is important. Pain localized to the groin and buttock, and difficulty with putting on shoes or getting in and out of a car was classified by the author according to its association with hip pathology. In addition, burning or electric character pain has been associated with lumbar spine pathology[1]. In both cases, accurate diagnosis would only have been possible with radiographic imaging, and detailed physical examination.

Offierski and MacNab[4] categorized hip spine syndrome according to four groups. The simple hip spine syndrome was defined as pathologic changes with a source of pain and disability. Secondary hip spine syndrome was defined as a hip deformity that causes aggravation of spinal symptoms. Cases involving both hip and spine symptoms with no clear source of pain were designated as complex hip spine

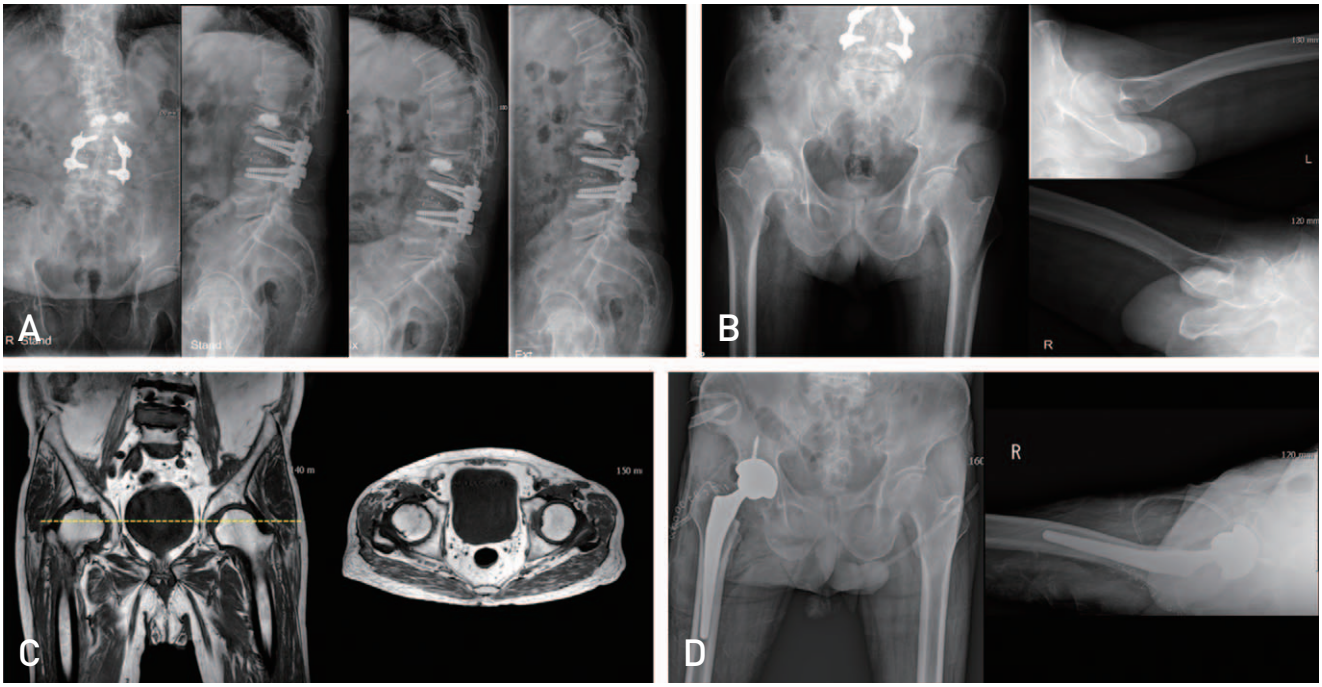

Fig. 3. Case of a 70-year-old male patient with misdiagnosed osteoarthritis of the hip. (**A**) Static and dynamic radiograph image showing the fusion state of L3-L4 spine. (**B**) Preoperative anteroposterior, trans-lateral radiograph image of the right hip. (**C**) Preoperative magnetic resonance image of the right hip. (**D**) Postoperative anteroposterior, trans-lateral image of the right hip.

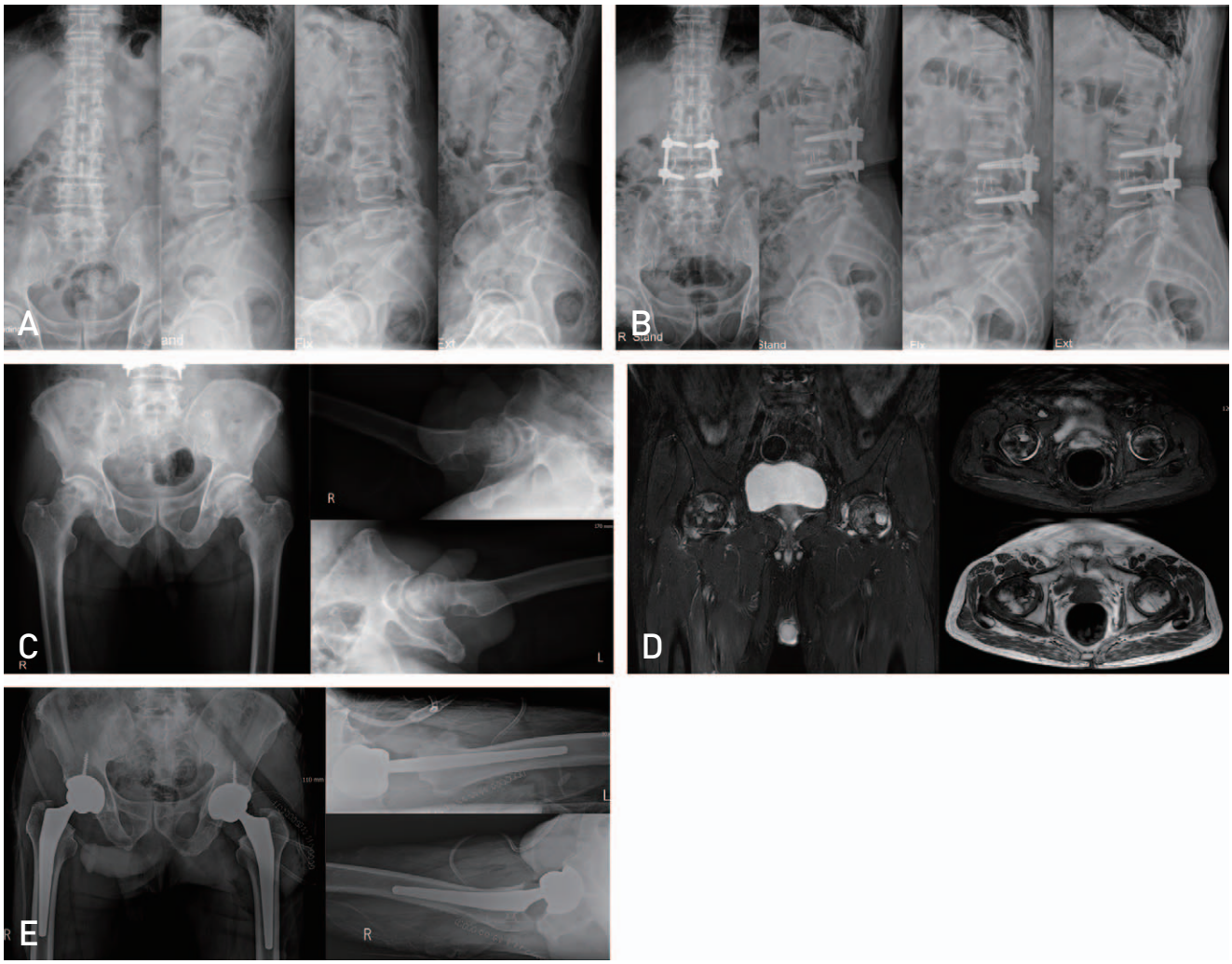

Fig. 4. Case of a 67-year-old male patient with misdiagnosed avascular necrosis of the hip. (**A**) Preoperative static and dynamic radiograph image of the lumbar spine. (**B**) Preoperative static and dynamic radiograph image of the lumbar spine. (**C**) Preoperative anteroposterior, trans-lateral radiograph image of both hips. (**D**) Preoperative magnetic resonance image of both hips. (**E**) Postoperative anteroposterior, trans-lateral image of both hips.

syndrome. Finally, incorrect diagnosis of the source of pain was designated as a misdiagnosed syndrome[4,13]. Cases involving patients who had undergone treatment related to the spine, including fusion of the vertebral body of the lumbar spine were identified; for some of these patients the pain continued after spinal surgeries. Their symptoms showed improvement after evaluation and surgical treatment of the hip. Therefore, physicians should be mindful of patients' symptoms, in order to determine their mechanisms as well as the locations of lesions in order to reduce pain.

Although Ben-Galim et al.[9] were the first to provide clinical validation of the hypothesis underlying hip-spine syndrome, their study focused on patients with lower back pain with no history of treatment. Unlike our study, their study did not include a group of patients with history of treatment of spinal lesions[9]. Previous studies focused mainly on spinopelvic parameters, such as pelvic inclination and sacral slope as predictors of lower back pain and radiating pain after THA[9,14] (Fig. 5). Forward inclination of pelvic alignment occurs in patients with osteoarthritis of the hip, leading to development of lumbar lordosis[15]. Development of lumbar lordosis can be a cause of lower back pain resulting from posterolateral bulging of the intervertebral disc[15]. After THA, significant increases in pelvic tilt and significant reductions in the sacral slope, lumbar lordosis, thoracic kyphosis, and T1 pelvic angle can result in alleviation of symptoms related to the spine, such as back pain and radiating pain[16,17].

The results of previously described articles are based on radiographic data. However, to the best of our knowledge, this is the first study focusing on improvements in patient

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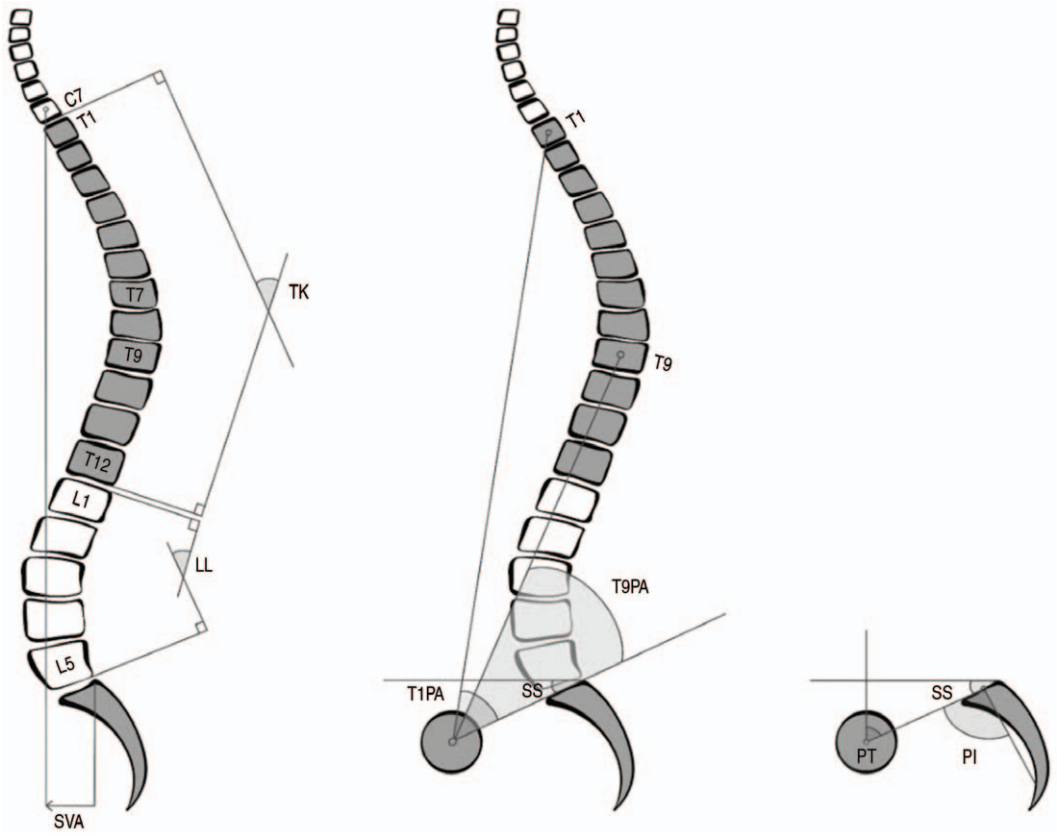

Fig. 5. Spinopelvic parameters.
TK: thoracic kyphosis, LL: lumbar lordosis, SVA: sagittal vertical axis, T1PA: T1 spinopelvic inclination, T9PA: T9 spinopelvic inclination, SS: sacral slope, PT: pelvic tilt, PI: pelvic incidence.

symptoms and ambulation[13].

This study has some limitations. First, due to the retrospective nature of our study, precise evaluation of the onset of patients' symptoms was not performed. Second, the study included a relatively small number of patients. A type II error may have occurred due to the small sample size; however, the results of post hoc analysis provided proof of the adequacy of the current study. Finally, although patients' symptoms were regarded as the main criteria for comparison, symptoms can differ due to other influences such as postoperative date and daily activity.

CONCLUSION

Patients with dual pathologies inclusive of degenerative diseases of the hip and spine exhibit various symptoms. According to the findings of this study, promising results were achieved after THA in elderly patients with debilitating hip diseases for both the prognosis of the disease as well as the patients' symptoms. In addition, in elderly patients, evaluation of both hip and spine should be performed for prevention of misdiagnosis and maltreatment. Thus, evaluation and treatment of pathologies of the hip is required for patients whose symptoms do not show improvement even after treatment of spinal pathologies.

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CONFLICT OF INTEREST

Ki-Choul Kim has been an editorial board member since June 2022, but had no role in the decision to publish this article. No other potential conflict of interest relevant to this article was reported.

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