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Pain in Non-Athlete Patients Undergoing Hip Arthroscopy for Femoroacetabular Impingement and Hip Labral Tears: A Longitudinal Study

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Abstract

Background: Pain in patients with orthopedic problems is an important aspect of surgical evaluation. However, the effect on the quality of life depends not only on the degree of pain but also on its type. Hip arthroscopy has been performed for hip joint symptoms caused by femoroacetabular impingement (FAI) and hip labrum tears. However, the degree and type of pain after hip arthroscopy remains unknown. **Objective**: This study aimed to clarify the degree and type of pain during 6 months after hip arthroscopy. **Methods**: Non-athlete patients aged 20 - 65 years who underwent hip arthroscopy between December 2018 and October 2019 participated in a questionnaire survey before hospitalization and at 1, 3, and 6 months after surgery. The questionnaire comprised the Japanese Orthopaedic Association Hip-Disease Evaluation Questionnaire (JHEQ) for quality of life, International Physical Activity Questionnaire (IPAQ) for activities, and the Short-Form McGill Pain Questionnaire (SF-MPQ-2) for pain. **Results**: The analysis included 10 patients (men: 4, women: 6, mean age: 38 ± 8.6 years, FAI: 6 cases, hip labrum tears: 4 cases). The average time from symptom onset to surgery was 26.9 ± 19.0 months. The analysis from before surgery to 6 months after surgery showed improvement over time in all scale scores (JHEQ, IPAQ, and SF-MPQ-2). The degree of pain was significantly improved based on the JHEQ visual analog scale evaluation (P = 0.019) 3 months after surgery. Significant improvement in intermittent pain (P = 0.011) based on SF-MPQ-2 was noted 3 months after surgery; however, no significant improvement in continuous pain was noted. **Conclusions**: Patients who underwent hip arthroscopy showed significant improvements in the degree of pain and type of intermittent pain from

before surgery to 3 months after surgery, however, no change was observed in continuous pain.

Keywords

Hip Arthroscopy, Orthopedic, Quality of Life, Type of Pain

1. Introduction

Osteoarthritis in older individuals and Perthes disease in children have received much attention in relation to hip pain. However, younger patients with hip symptoms show significantly worse pain, anxiety, and depression [1]. The presence or absence of hip lesions is related to the quality of life (QOL) and participation in social activities, including work, housework, and childcare. Therefore, hip lesions in young people must be actively addressed. In recent years, femoroacetabular impingement (FAI), hip labral injury, osteoarthritis, and hip dysplasia [2] have been identified as factors that contribute to hip pain in young people, which has led to various surgical interventions based on these factors [3].

FAI causes groin pain due to excessive contact between the acetabulum and the femur when the joint is in certain positions [3]. Additionally, repeated bone-on-bone collisions can damage the soft tissues of the hip joint, particularly the acetabulum and cartilage, eventually leading to arthritis, which is thought to be one of the causes of osteoarthritis in the long term [4]. The treatment of hip pain in young patients should begin with nonoperative management [5]. However, if conservative therapy does not improve the pain, hip arthroscopy is performed for hip pain associated with young FAI and acetabular labral injury [3]. FAI-related pain occurs intermittently during hip motion because of the influence of the femoral head and labrum. These events can also damage the labrum, which causes pain. Repeated hip movements that induce pain can lead to continuous pain. Patients seek treatment aggressively because the hip pain prevents them from performing work-related activities and activities of daily living (ADLs).

Recently, hip arthroscopy has been increasingly performed for the treatment of lesions inside and outside the hip joint owing to advances in diagnostic techniques (such as arthrography) and the development of surgical instruments. Hip arthroscopy is minimally invasive and has a shorter recovery period than surgical dislocation [6]. Therefore, it is performed as a treatment for FAI [7] and hip labral tears [8] in young people and athletes who engage in activities that place a high load on the hip joint. Consequently, hip arthroscopy is becoming a widespread treatment in Japan. Additionally, health-related QOL, which is one of the patient-reported outcomes in medical evaluation, is used to evaluate the therapeutic effects of hip arthroscopy. Patients with locomotor disorders have significantly lower scores on QOL scales [9] and health-related QOL measures for assessing hip QOL. Various scales have been developed and evaluated hip function

and symptoms [10]. Similarly, in hip arthroscopy, it is necessary to clarify whether the postoperative recovery status is a meaningful improvement from the patient's point of view.

Pain relief is important for improving QOL after hip arthroscopy, as the most common reason for patients with FAI to decide on surgery is "pain relief" [11]. To provide therapeutic intervention for pain, subjective pain must be assessed correctly [12]. The Short-Form McGill Pain Questionnaire 2 (SF-MPQ-2) is used to assess overall pain quality, including pain mechanism and neuropathic pain [12] [13]. Studies have reported that pain, symptoms, function of hip, and physical activity levels after hip arthroscopy are improved [14] [15] [16].

Previous studies have used hip function and QOL assessment tools, such as the Copenhagen Hip and Groin Outcome Score, modified Harris Hip Score, Hip Disability and Osteoarthritis Outcome Score, and the Japanese Orthopaedic Association Hip-Disease Evaluation Questionnaire (JHEQ), which assess only the frequency and degree of pain associated with movements and posture. However, the various types and degree of pain that occur after hip arthroscopy remain uncertain. Moreover, the quality of pain after hip arthroscopy has not been clarified in a longitudinal study. Hip arthroscopy is primarily performed on athletes; however, recently, it has been performed on nonathlete adolescents and young adults. Although there were studies that focused on athletes, there were no studies that focused on subjects who do not have sports as their profession. This study aimed to clarify the types and degree of pain experienced before surgery to 6 months after surgery in patients undergoing hip arthroscopy.

2. Methods

2.1. Study Design

This was a longitudinal study involving a questionnaire survey.

2.2. Participants

The study included patients aged 20 - 65 years who were scheduled to undergo hip arthroscopy. Patients were undergoing hip arthroscopy between December 2018 and October 2019 at a community hospital in Japan. Professional athletes and patients with dementia or mental illness were excluded from the study.

2.3. Data Collection

Questionnaire surveys were conducted before surgery and at 1, 3, and 6 months after surgery. The number of hip arthroscopy performed was predicted to be approximately 50 cases annually based on the number of surgeries performed in the past at the participating research hospital. Therefore, we assumed that 50% of patients undergoing surgery were eligible for the study. Furthermore, the dropout rate was set to 50%, considering the possibility of noncompliance with the study because 27% of the patients in previous studies had difficulty continuing to see their doctor after discharge owing to reasons such as residence or

self-determination [17], and we obtained consent for study cooperation for each survey. Thus, each study period was set to enroll 25 patients. The statistical power analyzed for a sample size of 25 patients was 0.96. The survey was conducted in the ward the day before surgery, and the postoperative survey was conducted in the outpatient department. Data collection at 1, 3, and 6 months after surgery was conducted in the outpatient waiting area. Data were collected when outpatients were waiting for their doctor.

2.4. Participant Characteristics

Data on patients' age, sex, diagnosis, occupation, period until surgery, timing of work resumption, and medicines for pain control were recorded.

3. Questionnaires

3.1. JHEQ: Japanese Orthopaedic Association Hip-Disease Evaluation Questionnaire

The JHEQ is a QOL evaluation tool that considers the Japanese lifestyle of patients with hip joint diseases. JHEQ contains items related to patients' hip joints, hip joint condition, pain, movement, and mental status [18]. A visual analog scale (VAS), which indicates the degree of pain, was used. This scale contains six items for pain and seven items for movement and mentality. The items are evaluated on a 5-point Likert scale: "strongly agree", "agree", "uncertain", "disagree", and "strongly disagree". Each factor scores a minimum of 0 points and a maximum of 28 points.

3.2. IPAQ: International Physical Activity Questionnaire Units

The short form of the International Physical Activity Questionnaire (IPAQ) was used to evaluate physical activity [19]. The IPAQ includes questions regarding the time and number of days that patients engage in four ADLs—leisure; housework (including garden work); work; and movement—within a week. Three types of activity intensity were used: vigorous-intensity activities (8.0 metabolic equivalents of task [MET]), moderate-intensity activities (4.0 MET), and walking (3.3 MET). The amount of each physical activity was calculated in terms of MET-minutes/week as follows: MET level × minutes of activity/day × days per week [20].

3.3. SF-MPQ-2: Short-Form McGill Pain Questionnaire 2

The SF-MPQ-2 was used to evaluate the quality of pain. SF-MPQ-2 comprises six items for continuous pain, six items for intermittent pain, six items for neuropathic pain, and four items for affective descriptors of the characteristics of the pain. This self-administered tool evaluates pain in the past week on an 11-point scale of 0 - 10. Itemized scores of continuous pain (0 - 60), intermittent pain (0 - 60), neuropathic pain (0 - 60), and affective descriptors (0 - 40) were calculated to assess the quality of pain. The higher the score, the stronger the pain level

[21].

4. Statistical Analysis

The median and interquartile range and the mean and standard deviation of each endpoint were calculated and verified for pre- and postoperative changes using the Friedman test. The Wilcoxon signed-rank test and Bonferroni correction were performed; a P-value of <0.05 was considered statistically significant. SPSS version 29.0 for Windows (IBM, Armonk, NY, USA) was used for all statistical analyses. Nonparametric methods were used because the data lacked normality. The sample size was determined based on the number of surgeries and 6-month longitudinal survey results, assuming cases in which the researcher could request cooperation in person at the time of the study and survey period; no statistical sample size calculations were performed. According to Hadlandsmyth [22], total knee arthroplasty as an investigation of pain from before surgery to 6 months after surgery yielded an effect size of 0.48. Using this effect size as a reference for this study, a sample size of 10 patients per group yielded a post hoc power of 0.67.

5. Ethical Considerations

This study was conducted after obtaining approval from the Health Science Ethics Committee of Kobe University (no. 725). All procedures were conducted according to the principles of the World Medical Association's Declaration of Helsinki.

Before commencement, informed written and verbal consent was obtained from each patient. Information contained in the informed consent form was explained to the patients, and data collection was initiated after they consented to the study. Furthermore, to prevent unnecessary linkage with the identity of the patients, the obtained data were anonymized and analyzed after recording.

6. Results

6.1. Participants

A total of 31 patients were enrolled in the study, of which 21 who could not be followed up to 6 months after surgery were excluded from the analysis of their preoperative and 6-month postoperative data. Ultimately, the remaining 10 patients (4 men and 6 women) who could be followed up to 6 months after surgery were included in the follow-up analysis (**Figure 1**). The average age of the patients was 38 ± 8.6 years. The average time from the onset of symptoms to surgery was 26.9 ± 19.0 months. Furthermore, all patients were employed and resumed work within 3 months after surgery (**Table 1**). Four patients used analgesics before surgery, and one took them until 6 months after surgery.

6.2. Pre- and Postoperative Progress

The longitudinal study of data collected before surgery to 6 months after surgery

revealed an improvement over time in all scales, including JHEQ, IPAQ, and SF-MPQ-2 (Table 2). Preoperative and 1-month postoperative data from 25 individuals were analyzed; however, the data varied markedly to be discussed against the analysis.

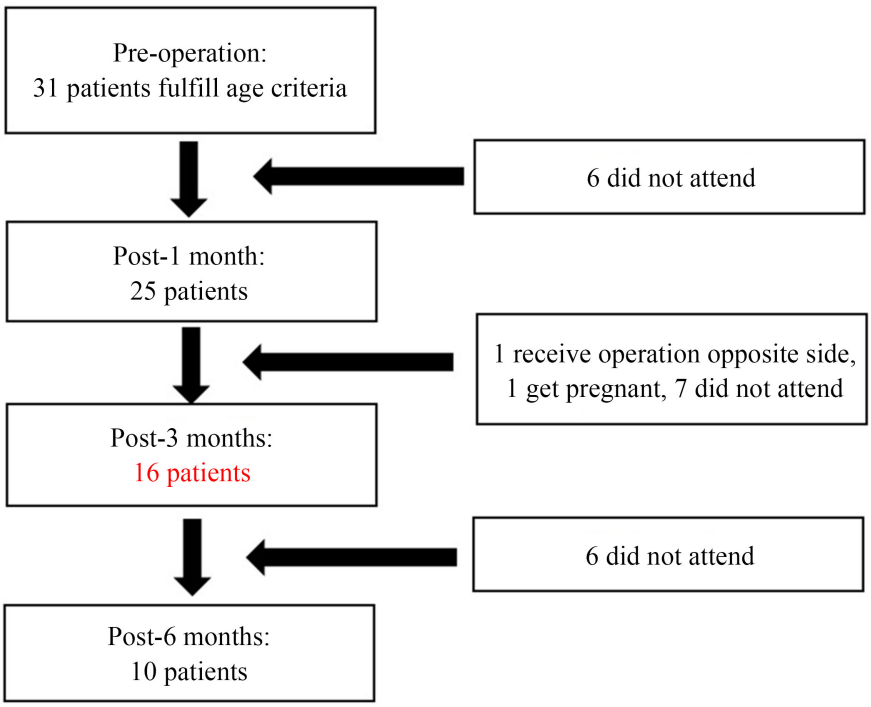

Figure 1. The process of determining the subject of the analysis.

Table 1. Patient characteristics.

	Age	Sex	Occupation	Diagnosis	Period from symptom onset to surgery (months)	Resuming work (months after surgery)
A	25	F	Health professional	Hip labral tear	25.4	3.0
B	32	F	Personal service worker	Hip labral tear	8.6	2.0
C	34	M	General office clerk	FAI	24.1	3.0
D	34	M	Driver	FAI	8.7	2.0
E	34	M	General office clerk	FAI	17.4	1.0
F	37	M	Science and engineering professional	Hip labral tear	64.3	3.0
G	37	F	Health professional	Hip labral tear	4.7	3.0
H	48	F	General office clerk	FAI	30.6	1.0
I	50	F	Personal care worker	FAI	48.6	3.0
J	51	F	Health professional	FAI	37.0	2.0

FAI, femoroacetabular impingement; M, Male; F, Female.

Table 2. Preoperative and postoperative patient-reported outcomes.

		Preoperative		Post 1M		Post 3M		Post 6M		Friedman test P-value	Significant difference at two points (P-value)		
		Median	IQR	Median	IQR	Median	IQR	Median	IQR		Pre-post 1M	Pre-post 3M	Pre-post 6M
JHEQ	**Pain**	13.5	8.8 - 17.3	20.5	15.0 - 22.5	24.5	18.3 - 28.0	26.0	21.0 - 28.0	<0.001	1.000	0.044	0.001
	Pain VAS	53.5	37.5 - 61.8	15.5	6.5 - 28.5	7.0	1.5 - 17.5	6.5	0.0 - 15.5	0.002	0.092	0.019	0.002
	Movement	15.0	8.5 - 18.8	8.5	6.5 - 20.0	25.0	14.8 - 27.3	25.5	21.0 - 27.3	<0.001	1.000	0.182	0.072
	Mental health	17.0	11.0 - 22.5	22.0	16.0 - 27.3	27.0	21.5 - 28.0	27.5	24.3 - 28.0	0.009	1.000	0.182	0.072
	Satisfaction[a]	24.0	16.3 - 70.5	27.0	17.5 - 66.3	19.0	5.0 - 37.5	6.0	2.3 - 023.8	0.257	1.000	1.000	0.995
IPAQ	**Vigorous activity**	0.0	0.0 - 1380.0	0.0	0.0	0.0	0.0 - 360.0	240.0	0.0 - 3600.0	0.008	1.000	1.000	0.846
	Moderate activity	140.0	0.0 - 420.0	0.0	0.0 - 10.0	120.0	0.0 - 450.0	120.0	0.0 - 900.0	0.091	0.340	1.000	1.000
	Walking activity	924.0	0.0 - 1534.5	643.5	0.0 - 866.3	874.5	767.3 - 1188.0	1188.0	965.3 - 1992.4	0.011	0.995	1.000	0.414
SF-MPQ-2	**Continuous pain**	9.0	2.0 - 15.8	8.0	2.0 - 12.5	2.0	0.0 - 6.3	0.5	0.0 - 2.5	0.003	1.000	0.092	0.056
	Intermittent pain	17.5	6.8 - 23.5	2.5	0.8 - 9.3	0.5	0.0 - 6.3	0.0	0.0 - 2.5	0.001	0.34	0.011	0.006
	Neuropathic pain	1.5	0.0 - 7.5	1.0	0.0 - 6.5	0.0	0.0 - 1.3	0.0	0.0	0.073	1.000	1.000	0.599
	Affective descriptors	3.5	0.0 - 10.3	0.0	0.0 - 3.3	0.0	0.0 - 0.3	0.0	0.0 - 0.5	0.036	1.000	0.278	0.414

Comparisons were made using the Friedman test with statistical significance set at $P < 0.05$. Wilcoxon signed-rank test was performed on significant differences between two points, and Bonferroni correction was performed on the obtained significant differences at $P < 0.05$. IQR, interquartile range; Post 1M, 1 month postoperative; Post 3M, 3 months postoperative; Post 6M, 6 months postoperative. JHEQ, Japanese Orthopaedic Association Hip-Disease Evaluation Questionnaire; VAS, visual analog scale; IPAQ, International Physical Activity Questionnaire short version; SF-MPQ-2, Short Form McGill Pain Questionnaire; n.s., not significant. [a]Lower score is better.

6.3. JHEQ Score

Significant changes in JHEQ pain ($P = 0.044$) and VAS pain ($P = 0.019$) scores were noted from before surgery to 3 months after surgery. JHEQ scores tended to improve over time (Table 2). Preoperatively, the JHEQ subitems showed that five patients had pain at rest and six patients had pain when sitting on a chair. Only two patients stated that the pain prevented them from sleeping. In contrast, regarding pain during movement, eight patients responded that they "strongly agree", "agree", or "uncertain". Nine patients also stated that they experienced difficulty moving freely. In both subcategories, the improvement from before surgery to 1 month after surgery varied. Three months after surgery, all eight patients who experienced pain during movement reported that their pain had improved, and seven patients experienced difficulties moving freely. No significant improvements in movement, mental health score, and satisfaction were noted (Table 2).

6.4. IPAQ Score

No significant change in any of the IPAQ domains was found from before surgery to 6 months after surgery. IPAQ showed a high degree of variability, and no clear trends of improvement were noted over time. Substantial individual differences in vigorous- and moderate-intensity activities (0 - 3600) were observed (Table 2).

6.5. SF-MPQ-2 Score

SF-MPQ-2 includes four domains of pain, and all types of preoperative pain were recorded. SF-MPQ-2 scores tended to improve over time. Continuous pain (2.0 - 15.8) and intermittent pain (6.8 - 23.5) had high scores. The median scores of continuous pain were 8, 2, and 0.5 at 1, 3, and 6 months after surgery, and this pain type scored the highest among pain types in all evaluation time points after surgery. Conversely, intermittent pain, neuropathic pain, and affective descriptors scored 0 at the 6-month follow-up period.

Only intermittent pain significantly improved at 3 months ($P = 0.011$). Among time points, neuropathic pain and affective descriptors scored low from before surgery (1.5:3.5) to 6 months after surgery (0:0) (**Table 2**).

7. Discussion

7.1. Participant Characteristics

Hip arthroscopy is typically performed in adolescents. In this study, the patients were aged 38 ± 8.6 years at the start of the study and all were employed. Hip arthroscopy was performed in adolescent to middle-aged patients [23]. The age of the patients in our study was consistent with that of patients in previous studies who underwent hip arthroscopy [24] [25] [26]. Additionally, all patients were employed. Therefore, it is important to continuously monitor their postoperative pain in order to address their pain.

7.2. Pain

In recent years, patients expect surgery for not only simple functional recovery and pain relief but also for improving their QOL by enhancing their leisure activities. These expectations have been met through the development of minimally invasive surgical methods and conventional hip surgery techniques and equipment. Pain is mainly recognized as acute and chronic pain, and interventions are provided based on both [27]. Moreover, a patient's understanding of pain is often based on the presence or absence of pain and the degree of pain [28]. In hip arthroplasty, pain assessment focuses on pain during movement and the degree of pain [29].

Consistent with previous studies [15] [30], the degree of pain in this study was significantly improved 3 months after hip arthroscopy.

As for the quality of pain, SF-MPQ-2 assesses continuous pain, intermittent pain, neuropathic pain, and affective descriptors depending on the characteristics of pain. Preoperatively, the pain was mainly intermittent and continuous. Moreover, regarding pain quality, intermittent pain improved significantly 3 months after surgery; however, continuous pain remained. In a previous study, intermittent pain was found to restrict social and leisure activities in patients with hip osteoarthritis more than continuous pain [31]. The level of preoperative intermittent pain reported in the present study (17.5) was higher than that reported in a previous study involving patients with low back pain (5.0) [12],

rheumatoid arthritis, and osteoarthritis (10.5) [13]. It is probable that the patients had limited activity due to intense preoperative intermittent pain and wanted to resolve it through surgery.

The results of the SF-MPQ-2 suggest that intermittent pain reflects pain during positional movement of the hip, and intermittent pain showed improvement 3 months after surgery. Although intermittent pain improved 3 months after surgery, no significant improvement in the patients' activity was noted based on their JHEQ movement and IPAQ scores. Patients' performance of activities did not improve significantly despite intermittent pain (the most intense pain) because of pain existing after discharge.

The pain observed after discharge was continuous pain, which was the second most intense pain before surgery. The patients resumed work despite continued pain after discharge because they needed to resume work. After hip arthroscopy for FAI, patients reported faster improvement in pain and ADL function and slower improvement in sports function. Moreover, patients with mild postoperative hip pain have lower hip function than healthy patients [15]. Thus, it is possible that the patients resumed work despite experiencing continuous pain and some limitations. Patients with pain are treated by devising exercises and posture changes so that they can lead to go on through their daily lives despite the pain [32] [33]. We predicted that ADLs would not significantly improve after resuming work because of restrictions on some activities due to continuous pain. Pain continuing after 6 months may be associated with work resumption during the recovery process.

This study revealed that patients experience pain for up to 6 months after surgery. Compared with other surgeries, orthopedic surgery is more likely to cause chronic postsurgical pain (CPSP), and a study reported that it occurs in 10% of hip arthroplasty cases [34]. In this study, the patients had various experiences regarding preoperative pain. Additionally, the patients experienced pain for a long period, with an average of 26.9 ± 19.0 months from the onset of pain to surgery. Thus, they had a high risk of CPSP.

Interventions for pain that continues to some extent after hospital discharge are based on a combined analysis of pain characteristics and clinical assessment, which can be used to infer the cause of the pain and tailor interventions to the type of pain [35]. Similarly, in hip arthroscopy, the identification of postoperative pain types in conjunction with clinical findings of postdischarge pain would enable individualized interventions based on pain characteristics, lifestyle, and activity intensity. Regarding pain management after hip arthroscopy, the effects of injections into nerve blocks, joints, and fascia 7 days immediately after surgery have been reported [36]; however, longitudinal pain management after surgery has not been investigated.

The results of this study revealed that the type of pain after hip arthroscopy was continuous/intermittent, and the time of improvement differed depending on the type of pain. These findings suggest that the type of pain must be considered to understand the patient's pain after surgery. Thus, in addition to the de-

gree of pain, the type of pain and its effect on physical function must be evaluated.

8. Limitations

The number of participants was small because it was difficult to continue the consultation after discharge. In addition, this study was conducted at a single medical facility over a limited and short period of time. Therefore, generalizations are limited. Further studies are needed to clarify the characteristics of pain in patients undergoing hip arthroscopy by increasing the number of subjects and institutions.

9. Conclusion

In this study, patients who underwent hip arthroscopy reported significant improvement in the degree of pain and type of intermittent pain from before surgery to 3 months after surgery, however, continuous pain remained. These results indicate that it is important to consider not only the degree of pain but also the type of pain on pain management.

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Conflicts of Interest

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

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