



Comparison of the effects of physiotherapy and ergotherapy applications on independent movement in hip fracture patients with hemiarthroplasty and PFN-A

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Abstract

Aim: In this study, our aim is to compare the effects of post-hip fracture hemiarthroplasty or PFN-A applications on the post-operative hip joint to provide enough range of motion to assist in daily activities, helping to regain lost muscle strength and to compare the effects on independent movement.

Materials and Methods: 15 patients who underwent hemiarthroplasty (Group 1) and 15 patients who underwent PFN-A (Group 2) were included in this study. These patients were aged between 50-80 who had operated at least 3 months ago, had no other lower extremity operation or trauma in the last 6 months, did not have any other physical and mental problems that prevented physiotherapy and occupational therapy due to the hip fracture. Physical therapy and occupational therapy methods were applied to both groups after surgery. These two groups were evaluated with the early postoperative period, after physical therapy and after occupational therapy, the Lower Extremity Functional Scale, Functional Independence Scale, Barthel Daily Living Activities Index, Harris Hip Assessment Scale and Timed Get Up and Go tests.

Results: After physical therapy applied according to the early postoperative period; a significant difference was obtained for all patients in the evaluations made with lower extremity function scale, Functional independence scale, timed up and go test, and Harris hip assessment scale. In addition to this treatment, a significant difference was achieved for all patients after the ergotherapy methods. Statistically significant differences were not found for Barthel's daily life activities test.

Conclusion: The negative thoughts created by the limitations in the functions of the elderly people is reduced with the ergotherapy application plan and providing support both physically and psychologically. The emotional changes that vary on according to the level of dependency of the patients, the use of auxiliary devices is taught in elderly individuals, especially considering their desire to be independent, their functions were restored with the multiple working method and the quality of life is increased.



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Introduction

As people age, hip fractures are one of the most common health problems we face today. However, with today's surgical treatment methods, it is possible for patients to reach bone stability that allows them to walk hours after surgery. This condition is extremely important in terms of

mortality and morbidity as a result of immobilization due to bed dependence and immobilization after the fracture [1,2].

The occurrence of atrophy and coordination disorder is a known situation after fracture and surgical treatment, especially in elderly patients, since it leads to a decrease in muscle strength and endurance. Since this situation greatly affects the activities of daily living (ADL) of the patients, it is necessary to apply surgical treatment and rehabilitation programs as soon as possible. Nowadays, the

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results of the surgery that disrupt the life order or prevent the functions that are enjoyed in life have reached a better point with the holistic studies of appropriate physical therapy and occupational therapy. Especially with the occupational therapy methods applied to these patients, many patients can achieve a satisfactory functional result by increasing the existing potential with motivation by providing independence to their basic ADL and making practical solutions and arrangements to the problems of the individual with an assistive device and by training including independent ambulation [3,4].

This study, in patients who underwent hemiarthroplasty or aPFN due to hip fracture, it was aimed to reveal whether these methods contributed to the return to ADL after physical therapy and ergotherapy applications on independent movement, and to determine whether these methods contributed, and at the same time, the level of contribution in which surgical application.

Materials and Methods

This study has ethical approval from Fatih Sultan Mehmet Training and Research Hospital Ethics Committee dated 25/06/2020 and numbered KAEK/47. Informed contents were obtained from the patients. The design of our study is to compare the effects of physical therapy and occupational therapy application results on independent movement in patients who underwent hemiarthroplasty or PFN-A due to hip fracture, using tests accepted in the literature. The study was aimed to be done with 15 hemiarthroplasty (group 1) and 15 PFN-A (group 2) who underwent hip fracture surgery applying to the Fatih Sultan Mehmet Hospital, Department of Orthopedics and Traumatology. Inclusion criteria in the study is being operated for a hip fracture and being between the ages of 65-80 and should be operated within last 3 months besides not had any other lower extremity operation or related trauma in the last 6 months additionally not had other physical therapy and occupational therapy applications and not have a mental problem. Those who had hip fracture surgery more than 3 months ago, those who had an operation or serious injury to the lower extremity in the last 6 months, those who had physical therapy in the last 3 months, and those who had other physical and mental problems that prevented physical therapy and occupational therapy were excluded from the study. Single blinding (masking) method was used in the study.

The patients in group 1 underwent hemiarthroplasty by removing the upper part of the broken hip bone and placing a prosthesis. For the patients in group 2, a nail implant (PFN-A) was placed inside the broken hip bone and the fracture parts were brought together and the fracture was aimed to heal.

Physical therapy and rehabilitation were applied to the patients with ankle pump, quadriceps and gluteal isometric exercises after pain control was provided on the same postoperative day. On the first day, they were seated at the edge of the bed or on a chair, then walking exercises twice a day and active quadriceps exercises were initiated while lying down. These exercises were continued gradually increasingly until discharge.

Isometric exercises, hip and knee flexion exercises, straight

leg lifting exercises, abduction exercises, knee range of motion exercises and postural exercises were given by gradually increased according to the level of application of the patients in the regular outpatient follow-ups provided after discharge. In patients' physical therapy programs walking more than 100 steps on flat surfaces, getting out of bed with assistance and using the toilet, and understanding the prohibited movements of the hip in particular were determined as the target point, and at this point it was decided that patients could take occupational therapy.

Common goals for an occupational therapy program are determined as transfer techniques for the transition from sitting to bed, getting out of bed techniques, techniques for domestic mobilization and landscaping, bathroom mobility, increasing daily sitting tolerance, reducing the number of people needed to assist with transfers, reducing assistance required for personal care, educating family members for the transfer. For this purpose, a guide was given to the patient and his relatives, including the movements that they can and cannot do. Especially always keeping the knee facing forward, standing in front of the operated leg (forward) while sitting or standing, using a high kitchen or bathroom stool when necessary. In summary, the maximum functionality and independence that the patient can provide in ADL by maintaining the hip-thigh angle is emphasized. As a result of the ergotherapy applications, the target point was to reach the level of activity before the fracture.

The Lower Extremity Functional Scale (LEFS), Functional Independence Scale (FIS), Barthel Daily Living Activities Index (BDLAI), Harris Hip Assessment Scale (HHAS) and Timed Up and Go tests (TUGT). These evaluations were made 3 times for each patient, including the early postoperative period (the period until discharge), after the physical therapy application and after the ergotherapy application.

Statistical analysis

IBM SPSS Statistics 22 (IBM Corp.; armonk, NY, USA) program was used for statistical analysis. Descriptive statistical methods (mean, standard deviation, median, frequency, percentage, minimum, maximum) were used when evaluating the study data. The suitability of quantitative data to normal distribution was tested by Shapiro-Wilk test and graphical examinations. Since the groups did not show normal distribution, Wilcoxon Test was used in the comparison of the two groups. Significance was evaluated at $P < 0.05$ levels.

Results

Compared to the early postoperative period both after the physical therapy methods applied and after the ergotherapy methods applied significant differences were obtained in the evaluations made with LEFS, FIS, HHAS, and TUGT ($p < 0.0001$) (Table 1). For BDLAT, no statistically significant differences were found.

In comparison of the effectiveness of physical therapy methods and occupational therapy methods on the groups a statistically significant difference was observed in favor of group 1 for LEFS and FIS as a result of physical therapy applications, and in favor of group 2 in all tests with

Table 1. Comparison of Physical Therapy and Ergotherapy.

| | AEFS | FBÖ | HKÖD | ZKYT |
|---------|--------|--------|--------|--------|
| Group 1 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Group 2 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |

* Wilcoxon test (LEFS: Lower Extremity Functional Scale, FIS: Functional Independence Measure, HRS: Harris Hip Rating Scale and TUGT: Timed Up and Go Test).

the results of occupational therapy methods (Table 2-5). The primary result of the study was that there was a significant difference for all patients in the evaluations made with the LEFS, FIS, TUGT and HRS after physical therapy applied compared to the early postoperative period ($p < 0.005$).

Discussion

Based on the results of our study, both surgical treatment methods are conclusively based on the independent action of physiotherapy and ergotherapy applications in early stages that they have positive effects. However, when we compare these two treatment methods, comparative scores were obtained firstly in hemiarthroplasty patients (group 1) after physical therapy applications, and in patients who were applied PFN-A as a result of the ergotherapy methods applied afterwards. We take this result; we interpreted that hemiarthroplasty patients, in which the fractures were completely removed and only soft tissue healing was required, returned to their daily activities faster, especially with physical therapy applications in the early period. However, we interpreted the fact that due to the nature of the PFN-A application, the patient's bone healing as a result of osteosynthesis and the ergotherapy methods applied in addition to physical therapy, the patient's return to daily life activities is more positive as the patient's adaptation to his own hip joint rather than prosthesis.

Hip fracture is an important orthopedic problem for the elderly population. These fractures have become more common as a result of the prolongation of life. While hip fractures may occur as a result of a simple fall in elderly patients, younger patients require a high-energy trauma such as a traffic accident or falling from a height for hip fracture to occur. Osteoporosis, which is seen in elderly patients, is the most important reason for hip fracture in these patients. Hip fractures include two main types: the intracapsular (cervical) and the extracapsular (trochanteric and subtrochanteric) fractures. As the age progresses, the risk of osteoporosis increases with the decrease of estrogen hormone in the body. At the same time, secondary problems such as increased traffic and occupational accidents, muscle weaknesses caused by the advancement of age, high blood pressure, high sugar or low sugar, stroke cause the patient to fall with a decrease in balance and cause fractures in the weakened bone. Another problem with these patients is the presence of other diseases such as heart, high blood pressure, diabetes, and lung problems. Additional diseases of this type often affect the process of treatment and rehabilitation of hip fracture of elderly patients. Operative options include in situ fixation, closed

or open reduction and internal fixation, hemiarthroplasty, and total hip arthroplasty. After surgery, patients are bed-dependent and long-lasting bed rest, mortality and morbidity as a result of immobilization have been observed in the first year of 15-30% of patients [5-8].

As a result, patients with hip fractures are generally elderly patients with additional diseases, decreased senses such as vision and balance, and relatively reduced mobility. In this case, the choice of surgery to be performed by orthopedics can be chosen by considering these characteristics of the patient. In general, orthopedic surgeons either apply hemiarthroplasty, or partial hip prosthesis, by removing the upper part of the fractured hip bone for these patients, or by placing a nail implant (PFN-A) into the broken hip bone, they bring the broken parts together and aim to heal the fracture. Total hip replacement is applied as one of the treatment options [12]. However, we included our patients who underwent hemiarthroplasty in our study. PFN-A can be safely applied in a carefully selected group of patients with femoral neck fractures as well as extracapsular (trochanteric and subtrochanteric) hip fractures [13]. In fact, the main purpose in the treatment of hip fractures is to save the patient from being tied to the bed, whichever method is used, and return the patient to his / her pre-fracture functional state as soon as possible. Delirium, infection, embolism, and nutritional disorders are mostly seen during the care period in which especially elderly patients stay bedridden, and thus other systemic diseases get worse. At the same time, because these patients cannot move due to fractures, pressure sores may occur due to long stay in the bed, blood clot in the leg veins and clot in the lung (thromboembolism) or lung and urinary tract infection may develop. All these are problems that put the patient's life at risk [14,15].

At this point, it is necessary to start rehabilitation of the patient as soon as possible after the surgery, to provide enough range of motion to help the hip joint to provide daily activities and to regain lost muscle power. Otherwise, most patients after surgery do not reach their functional level before the fracture. A fracture that occurs at the same time significantly increases the risk of the next fracture. In order to achieve the best results in patients with hip fractures, a multidisciplinary team including orthopedics, physical therapy and occupational therapists should work in coordination from the time of their admission to the hospital, until they are discharged and return to the activity level before the fracture. In this process, rehabilitation is imperative to improve disability and survival rates. By evaluating the patient's ADL, following the developments, knowing about his potential and identifying his addiction, determining the dangers in the home environment and ensuring his safety in the activities will reduce the risk of falling. Stabilization of the hip, reducing pain, preventing complications that may occur and restoring their functions will help strengthen the bones. The lack of communication skills affects the performance of elderly individuals as the enjoyment of life after surgery decreases. The detection and treatment of patients with high risk is extremely important. As a result, survival rates can increase [16-20] with maximum functionality, which can be earned by achieving maximum recovery with the right

Table 2. Comparison of two groups for lower extremity functional scale.

| LOWER EXTREMITY FUNCTION SCALE | | Group 1 (n = 15) | Group 2 (n = 15) | p |
|-------------------------------------------|--------------|------------------|------------------|---------|
| Postoperative Early period | Mean ± SS | 7.07 ± 1.22 | 7.07 ± 0.96 | 0.806 |
| | Median value | 7 | 7 | |
| After the application of physical therapy | Mean ± SS | 23.86 ± 1.45 | 21.20 ± 1.45 | 0.00001 |
| | Median value | 24 | 21 | |
| After the application of ergotherapy | Mean ± SS | 33.06 ± 1.09 | 35.00 ± 0.65 | 0.0001 |
| | Median value | 33 | 35 | |

* Shapiro-Wilk test.

Table 3. Comparison of two groups for the scale of functional independence.

| SCALE OF FUNCTIONAL INDEPENDENCE | | Group 1 (n = 15) | Group 2 (n = 15) | p |
|-------------------------------------------|--------------|------------------|------------------|---------|
| Postoperative Early period | Mean ± SS | 62.07 ± 0.70 | 63.13 ± 1.33 | 0.01 |
| | Median value | 62 | 63 | |
| After the application of physical therapy | Mean ± SS | 81.20 ± 1.37 | 81.93 ± 1.33 | 0.00001 |
| | Median value | 87 | 82 | |
| After the application of ergotherapy | Mean ± SS | 99.00 ± 0.84 | 102.06 ± 1.53 | 0.0001 |
| | Median value | 99 | 102 | |

Table 4. Comparison of two groups for timed up and go test.

| TIMED UP AND GO TEST | | Group 1 (n = 15) | Group 2 (n = 15) | p |
|-------------------------------------------|--------------|------------------|------------------|-------|
| Postoperative Early period | Mean ± SS | 22.93 ± 2.63 | 23.67 ± 2.32 | 0.367 |
| | Median value | 22 | 24 | |
| After the application of physical therapy | Mean ± SS | 13.06 ± 0.88 | 13.13 ± 0.99 | 0.744 |
| | Median value | 13 | 13 | |
| After the application of ergotherapy | Mean ± SS | 10.86 ± 1.06 | 8.73 ± 0.88 | 0.001 |
| | Median value | 11 | 9 | |

Table 5. Comparison of two groups for Harris hip assessment scale.

| HARRIS HIP ASSESSMENT SCALE | | Group 1 (n = 15) | Group 2 (n = 15) | p |
|-------------------------------------------|--------------|------------------|------------------|-------|
| Postoperative Early period | Mean ± SS | 17.87 ± 0.35 | 17.80 ± 0.41 | 0.775 |
| | Median value | 18 | 18 | |
| After the application of physical therapy | Mean ± SS | 50.46 ± 1.64 | 50.40 ± 1.54 | 0.902 |
| | Median value | 50 | 50 | |
| After the application of ergotherapy | Mean ± SS | 54.93 ± 1.66 | 57.40 ± 2.74 | 0.009 |
| | Median value | 55 | 57 | |

strategies in the treatment of hip fracture.

The limitations of the study are the lack of power analysis and the limited number of patients was the most significant limitation. However, in patients who are familiar with working with upper extremity functions and have been treated after fracture, the appropriate methods of ergotherapists are used for lower extremity internal has caused difficulties in adapting and selecting appropriate assessment scales [21,22]. As an example, the Barthel index of daily life activities we used for evaluation was not an accurate measurement tool for this research.

As a result, many previous studies have repeatedly em-

phasized the importance and usefulness of physical therapy after hip fracture. However, the psycho-social effects of individuals who come to the hospital due to hip fracture have an impact on their communication skills, quality of life and social participation. The lack of independent activities of daily living and quality of life in the reduction of people also creates psychological effects. However, there was also a noticeable motivation difference in patients with an ergotherapy intervention plan.

Conclusion

Ergotherapy provides motivational support in elderly individuals who have undergone hip fracture treatment, and it is extremely important to add these positive effects of ergotherapy methods to physical therapy methods.

Ethics approval

Reviewed by the University of Health Sciences Fatih Sultan Mehmet Training and Research Hospital Clinical Research Ethics Committee as the FSMEAHA KAEK 2020/47 study and approved with the 2020/12 meeting decision on 25.06.2020.

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