SJIF Impact Factor: 5.464

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 5.
Issue: 3.
Page N. 01-08
Year: 2021

Research Article ww.wjahr.com

# EARLY AND LATE RESULTS OF THE PHYSIOTHERAPY PROGRAM IN THE PATIENT WITH SIMULTANEOUS BILATERAL ROBOTIC SURGERY DUE TO DEVELOPMENTAL HIP DYSPLASIA-CASE REPORT

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**Received date:** 21 February 2021 **Revised date:** 15 March 2021 **Accepted date:** 04 April 2021

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## ABSTRACT

Developmental Hip Dysplasia (DHD) is defined as a pathological condition where the structures that make up the hip joint show structural impairment for various reasons and the relationship between the femur and acetabulum is disturbed, although normal in intrauterine life. The aim of this case study is to present the results of the physiotherapy program after simultaneous bilateral MAKOplasty surgery due to DHD. In the literature, bilateral simultaneous hip arthroplasty surgical procedures are very rare and there is no study showing the effectiveness of the physiotherapy program after MAKOplasty surgery. The results of our case are the first study of this nature. 50-year-old woman who underwent total hip prosthesis with bilateral simultaneous robotic surgery due to DHD, 8 weeks of physiotherapy and rehabilitation program, early and late effects on pain intensity, lower extremity range of motion, lower extremity muscle‟s strength, kinesiophobia, ability to forget the artificial joint and hip function were evaluated. According to the results of the evaluation made at the end of the study and at the end of the 6th month, it was observed that the pain intensity of the individual decreased, hip and knee joint range of motion and muscular strength increased, at the same time began to forget the artificial joint and joint awareness improved, decreased fear of movement and increased functional level. The 8-week physiotherapy program planned for the individual is considered to be of great importance in increasing the functional level of the patient.

**KEYWORDS:** Hip, Total Hip Arthoplasty, Physiotherapy, Exercise.

## INTRODUCTION

Developmental hip dysplasia (DHD) is a dynamic disease in which the relationship of the structures that make up the hip is disturbed. The old term "Congenital Hip Dislocation" was replaced by "Developmental Hip Dysplasia" in 1989 with the recommendation of Klisic, since it was noticed that babies with normal hips at birth may develop dysplasia, subluxation or dislocation.[1] While the relationship between the femoral head and the acetabulum has been completely disrupted in dislocation, this relationship has not disappeared and decreased in subluxation. Dysplasia, on the other hand, refers to the inadequate development of the acetabulum. The relationship between the femoral head and the acetabulum is disrupted or disappeared in DHD. As treatment delays, this mismatch worsens and can irreversibly cause hip disruption.[2] DHD is one of the most common causes of hip osteoarthritis at an early age, which can lead to severe pain and limited mobility and consequently walking problems.[3-5]

In the treatment of DHD, pain control is tried to be achieved by conservative methods such as weight loss, pain relievers, physiotherapy and rehabilitation and movement modifications, while pelvis and femur proximal osteotomies are among the options in early cases. However, total hip arthroplasty (THA) surgeries are preferred in cases with late-stage advanced hip osteoarthritis or high hip.[5-7] In THA, contact of damaged surfaces is prevented and pain is prevented. Since the pain disappears, an improvement in joint range of motion is also observed.[8,9] Studies show that the damage caused by this surgical intervention causes impaired walking function, decreased hip abductor function and walking asymmetry.[10,11] No matter how accurately the surgical procedure is performed, the THA inevitably damages the muscles, periarticular tendons and leads to loss of joint proprioceptors.[12] Various

methods have been developed to try to minimize complications caused by THA and to correctly position acetabular components in three dimensions (3-D).[13] Robotic surgery is a high-end technology developed for hip replacement surgery.[14-16] In hip replacement surgery, even an experienced orthopedic surgeon has some margin of error when manually adjusting the implant positions. If the error rate is too high for both implants, complications such as dislocation of the prosthesis, decreased range of motion, leg height difference or mechanical failure may occur. Computerized tomography film of the hip joint is taken before the surgery with the MAKOplasty System. The system determines the natural joint kinematics of the patient, calculates the proper placement of the prosthetic parts accordingly, and model information is used with the RIO software to plan the surgery in accordance with the patient's anatomy. During the operation, the robotic arm guides the orthopedic surgeon in the most accurate positioning and alignment of the implants. Thus, while the system minimizes the margin of error, it ensures that the postoperative recovery period is shorter, more painless and more comfortable.[13,17,18], Due to the decrease in the possible risk of complications (hip dislocation, leg length asymmetry, mechanical relaxation) the patient returns to daily life more quickly. The aim of this case study is to present the results of the physiotherapy program after simultaneous bilateral MAKOplasty surgery due to DHD.

## MATERIALS AND METHODS

### Case Description

A 50-year-old teacher woman underwent bilateral simultaneous MAKOplasty surgery due to bilateral developmental type 4 hip dysplasia. She stated that she had problems with hip joint since childhood, especially in the last 8 months before surgery. She applied to the doctor with complaints of pain and limping in both hips, especially in the right hip. According to the bilateral coxofemoral computed tomography report before surgery; It has been stated that the joint gap is narrowed in both coxofemoral joints, numerous chronic degenerative changes are detected on the acetabular and femoral head joint surfaces, and at the same time, cystic resorption are observed. Both cocsofemoral joints are shallow and there is a loss in both femoral head convexities, and osteophytic formations on both sides are reported in acetabular corners. As a result of the physical examination performed before surgery, it was recorded that the range of motion of both hips in the sagittal plane was 70 °, the rotational movements in the horizontal plane were 0 ° and the intensity of pain was 7 according to Visual Analogue Scale. As a result of all evaluations, it was deemed appropriate to perform bilateral simultaneous MAKOplasty hip endoprosthesis surgery (Figure 1). The case was evaluated on the first day she applied to physiotherapy after discharge, after the 8-week Physiotherapy and Rehabilitation program and 6 months after surgery.


**Figure 1: Bilateral hip X-ray figure of the patient (3 months after surgery)**

Before the evaluations and treatment, both verbal and written information was given to the patient, and written consent was obtained. Evaluations were made after recording the patient's story and demographic information. It was noted that the dominant hand-foot preference of a 50-year-old woman was left side, height length 1.56 cm, body weight 54 kg, body mass index 22.19 kg / m2. Assessments to the patient are summarized in Table 1.

## EVALUATION PARAMETERS

**Table 1: Evaluation parameters and assesment methods.**

| PARAMETERS | METHODS | WEEKS |
|---|---|---|
| *Pain Intensity(rest, activity, nigth, worst time)* | Visual Analogue Scale | 1.,8. week, 6. month |
| *Range of Motion (hip, knee,ankle)* | Universal Goniometer | 1.,8. week, 6. month |
| *Muscle Strength (lower extremity muscles)* | Manual Muscle Test | 8. week, 6. month |
| *Ability to Forget the Artificial Hip Joint* | Forgotten Joint Score-12 | 1.,8. week, 6. month |
| *Kinesiophobia* | Tampa Kinesiophobia Scale | 1.,8. week, 6. month |
| *Functional Level* | Oxford Hip Score | 8. week, 6. month |

Visual Analogue Scale was used to assess pain intensity. The patient was asked to mark the intensity of the pain during rest, activity, nigth and the pain she felt when the pain was worst on a 0 to 10 cm line. The distance between the point marked by the individual and the "0" point where there is no pain was measured with the ruler and the value found was recorded in centimeters. Evaluation was performed bilaterally.[19,20]

Joint range of motion of hip, knee and ankle joints were evaluated with universal goniometer. The evaluation was made bilaterally. Measurements were made bilaterally three times and recorded in mean value degrees unit.[21-24]

The strength of the muscles of the hip circumference and other related muscles of the lower limbs were evaluated by manual muscle test method. In the manual muscle test, according to the Lovett scoring system, a score of 0-5 was given depending on whether the patient was able to complete the movement against gravity in the desired position and whether she could gain resistance in this position.[25,26]

Forgotten Joint Score-12 (FJS-12) was applied after the total hip replacement to determine the patient's ability to forget the artificial hip joint. FJS-12 is a scale that questions the awareness of the artificial joint from the patient's eye during various daily life activities after arthroplasty surgery. The questionnaire contains 12 questions scored based on a 5-point Likert rating. The result obtained is translated into a raw score between 0-100. High score means good result. Kınıklı et al. showed that Turkish FJS-12 is a valid and reliable scale in the Turkish population with hip and knee arthroplasty.[27,28]

Tampa Kinesiophobia Scale with 17 questions was used to evaluate the pain related fear. The Tampa Kinesiophobia Scale (TKS) is a Likert-type scale developed to measure the patient's fear of movement / re-injury. In this scale, in which the person has a total score between 17-68, a 4-point Likert score is used. High scores show that the presence of kinesiophobia in the person is also high.[29] The scale is widely used in hip-related pathologies, especially before and after hip osteoarthritis and hip and knee arthroplasties.[30,31]

Oxford Hip Score (OHS) was used to evaluate the patient's pain and functional status. In patients undergoing hip arthroplasty, OHS is applied to evaluate the pain, mobility and functions of the hip joint. OHS consists of 12 questions related to perceived pain and functional status of the patient and is answered on a likert scale from 0 to 4.[32,34] Turkish adaptation study made by Tuğay et al.[35]

At the same time, it was stated that the lower extremity inequality was eliminated in the radiology performed at the 3rd month after the surgery with a preoperative radiology report.

**TREATMENT PROGRAM**

Postoperative rehabilitation was performed for 5 days by the physiotherapist of the hospital in the first week. Postoperative 2nd week, the patient applied to our clinic. The patient received a physiotherapy program, which included 16 sessions of electrotherapy, massage and progressive exercise exercises for 2 hours, 2 days a week and 8 weeks in total. During the treatment program, Neuromuscular Electrical Stimulation (NMES) was applied to both hips on M. Gluteus Medius and M. Quadriceps Femoris muscles for 20 minutes. Then, scar tissue massage was applied to and around the incision. Stretching, strengthening, walking training, balance-coordination and proprioception exercises were included in the exercise program. The difficulty level of the exercises was changed using different weights and different surfaces. The exercise program applied from the 2nd postoperative week is shown in Table 2. The patient was instructed to continue the exercises outside of the physiotherapy sessions. Exercise brochure about the visuals and how to do the exercises were prepared everyweek. All exercises were done on both sides. The exercises were performed 3 times a day, with 10 repetitions. Our patient started swimming after 8 weeks physiotherapy and rehabilitation program.

**Table 2: 8-week physiotherapy and rehabilitation program.**

| **POSTOPERATIVE WEEK 1** |
|---|
| Information about postoperative positioning, what to do and not to pay attention was repeated.<br>Ankle Pumping Exercise<br>Circular Movements of the Ankle<br>Isometric Quadriceps Exercise<br>Supine Active Assistive Hip Abduction<br>Heel Shift Exercise (not exceeding 90 °)<br>Standing Up from Sitting Position (with Walker)<br>Walking Training with Walker |
| **POSTOPERATIVE WEEK 2** |
| Exercises continued in the previous week and new exercises were added.<br>Terminal Knee Extension<br>Adductor Isometric<br>Active Knee Extension in Sitting<br>Walking Training with Canadian type crutches |
| **POSTOPERATIVE WEEK 3** |
| The previous week's exercises were continued, new exercises were added, the exercises were progressed.<br>Terminal Knee Extension (with 0.5 kg heavy bag)<br>Active Knee Extension In Sitting (with 0.5 kg heavy bag)<br>Hip-Knee Flexion In Sitting<br>Independent Walking Training<br>Side Walk |
| **POSTOPERATIVE WEEK 4** |
| Exercises continued in the previous week, new exercises were added, and progression was achieved in the exercises.<br>Active Hip Abduction<br>Bridging Exercise<br>Hip and Knee Flexion In Sitting (with 0.5 kg heavy bag)<br>Active Hip and Knee Flexion by Taking Support from a Standing Place (Up To 90 Degrees)<br>Active Hip Abduction with Support from a Standing Place<br>Active Hip Extension by Getting Support from a Standing Place<br>Support Bilateral Heel Lift from a Standing Place<br>Walking By Jumping Over Obstacles<br>Step Exercise (Front-Side) |
| **POSTOPERATIVE WEEK 5** |
| Exercises continued in the previous week, new exercises were added, and progression was achieved in the exercises.<br>Hip Abduction with Heavy Bag on Supine Position (1 kg)<br>Resistant Hip Abduction While Hip and Knee Flexion<br>Bridging Exercise on Soft Ground<br>Side Walk (with 1 kg heavy bag)<br>Going Down and Up The Stairs<br>Step Exercise with Metronome (Front-Side) (70 bpm) |
| **POSTOPERATIVE WEEK 6** |
| Exercises continued in the previous week, new exercises were added, and progression was achieved in the exercises.<br>Bridging Exercise on One Leg on Soft Ground<br>Straight Leg Lifting (*Straight leg lifting exercise is an exercise that should be avoided especially in the early period (first six weeks) as it places a very large load on the hip joint outside the plane of movement and causes considerable strength in the joint)*<br>Hip Flexion with Therabant (Standing Position)<br>Hip Abduction with Therabant (Standing Position)<br>Hip Extension with Therabant (Standing Position)<br>Stepping with 1 kg Heavy Bag (70bpm metronome speed)<br>Standing on One Leg<br>Brisk Walking Training with Metronome |

| **POSTOPERATIVE WEEK 7** |
|---|
| Exercises continued in the previous week, new exercises were added, and progression was achieved in the exercises.<br>Mini Squat on Wall<br>Standing on One Leg on Soft Ground<br>Reaching Forward While Standing Single Leg on Soft Ground |
| **POSTOPERATIVE WEEK 8** |
| Exercises continued in the previous week, new exercises were added, and progression was achieved in the exercises.<br>Standing on Double Legs with Eyes Closed on Soft Ground<br>Eyes Closed Reciprocal Weight Transfer on Soft Ground<br>Perturbation Exercises on Soft Ground |

## RESULTS

The pain intensity and normal joint movement degrees results are given in table 3. A significant decrease in the intensity of pain, which was evaluated at different times of our patient, was observed. This decrease became especially evident at the end of week 8. It is concluded that the Physiotherapy and Rehabilitation program applied in the postoperative period is effective in reducing the intensity of pain. The effects of the physiotherapy program on pain intensity continued in the long term. Our patient even stated that she completely forgot the pain she felt before surgery. Also, an increase in the range of joint range of motion of the hip and knee joint was observed in the post-treatment period. These effects continued at the end of the 6th month.

**Table 3: Pre-treatment, early and late evaluation results of the patient**

| **Pain Intensity (cm)** | **1. Week** | | **8. Week** | | **6. Month** | |
|---|---|---|---|---|---|---|
| | **Rigth Hip** | **Left Hip** | **Rigth Hip** | **Left Hip** | **Rigth Hip** | **Left Hip** |
| *Rest* | 2.2 | 1.5 | 0 | 0 | 0 | 0 |
| *Activity* | 8 | 8 | 1 | 0 | 0,2 | 0 |
| *The worst moment she felt* | 10 | 10 | 4,8 | 1 | 0 | 0 |
| *Night* | 8 | 4 | 1.2 | 0 | 0 | 0 |
| **Hip Normal JointMovement (°)** | **1. Week** | | **8. Week** | | **6. Month** | |
| | **Right** | **Left** | **Rigth** | **Left** | **Right** | **Left** |
| Flexion | 45 | 70 | 120 | 125 | 125 | 125 |
| Hyperextension | It could not be measured because she could not be laidprone. | | 10 | 10 | 10 | 10 |
| Abduction | 20 | 10 | 45 | 45 | 45 | 45 |
| Hyperadduction | Not Assesed. | | Not Assesed. | | 10 | 10 |
| Internal Rotation | | | 42 | 40 | 45 | 45 |
| External Rotation | | | 41 | 43 | 45 | 45 |
| **Knee Normal JointMovement (°)** | **1. Week** | | **8. Week** | | **6. Month** | |
| | **Right** | **Left** | **Right** | **Left** | **Right** | **Left** |
| Flexion | 110 | 100 | 138 | 132 | 140 | 140 |
| **Ankle Normal Joint Movement (°)** | **1. Week** | | **8. Week** | | **6. Month** | |
| | **Right** | **Left** | **Right** | **Left** | **Right** | **Left** |
| Dorsi Flexion | 20 | 20 | 20 | 20 | 20 | 20 |
| Plantar Flexion | 45 | 45 | 45 | 45 | 45 | 45 |
| Inversion | 35 | 35 | 35 | 35 | 35 | 35 |
| Eversion | 20 | 20 | 20 | 20 | 20 | 20 |

Results of the muscle strength values of the muscles are given in Table 4. Postoperative 1st week muscle strength assessment was not performed since the joint can be challenging. Comparing the results of the 8th week with the results of the 6th month, an increase in the strength of the muscles around the hips was observed. Hamstring muscle strength is increased in the knee.

**Table 4: Pre-treatment, early and late evaluation results of the patient**

| **Hip Muscle Strength** | **8. Week** | | **6. Month** | |
|---|---|---|---|---|
| | **Right** | **Left** | **Right** | **Left** |
| *Flexors* | 4 | 4 | 5 | 5 |
| *Extensors* | 5 | 5 | 5 | 5 |
| *Abductors* | Not Assesed. | | 4 | 4 |
| *Internal Rotators* | 4 | 4 | 5 | 4 |
| *External Rotators* | 4 | 4 | 4 | 5 |
| **Knee Muscle Strength** | **8. Week** | | **6. Month** | |
| | **Right** | **Left** | **Right** | **Left** |
| *Hamstring* | 4 | 4 | 5 | 5 |
| *Quadriceps Femoris* | 5 | 5 | 5 | 5 |
| **Ankle Muscle Strength** | **8. Week** | | **6. Month** | |
| | **Right** | **Left** | **Right** | **Left** |
| *Dorsi Flexors* | 5 | 5 | 5 | 5 |
| *Plantar Flexors* | 5 | 5 | 5 | 5 |
| *Invertors* | 5 | 5 | 5 | 5 |
| *Evertors* | 5 | 5 | 5 | 5 |

The results of the Forgotten Joint Score-12, Tampa Kinesiophobia Scale and Oxford Hip Score are given in table 5. When the table 4 was examined, it was observed that there was an increase in the Forgotten Joint Score, a decrease in the Tampa Kinesiophobia Scale scoring and Oxford Hip Score. The 8-week physiotherapy and rehabilitation program has been shown to be effective in the development of artificial joint awareness, reducing fear of movement, and increasing hip functions.

**Table 5: Pre-Treatment, early and late evaluation results of the patient**

| | **1. Week** | **8. Week** | **6. Month** |
|---|---|---|---|
| *Forgotten Joint Score-12* | 29.17 | 79.17 | 83.4 |
| *Tampa Kinesiophobia Scale* | 48 | 36 | 34 |
| *Oxford Hip Score* | 45 | 19 | 16 |

## DISCUSSION

After an 8-week study in a patient who underwent bilateral macoplasty surgery due to congenital hip dysplasia, it was observed that there was an improvement in pain intensity, lower extremity joint range of motion and muscle strength, as well as artificial joint awareness, movement fear and functional level. When the literature is examined, there is no study emphasizing the effectiveness of the physiotherapy program after MAKOplasty surgery.This aspect of our study has a first quality. Within the scope of our study, during the 8-week treatment period, the exercises were advanced from easy to difficult by grading the exercises. stretching, strengthening, balance, proprioception, stabilization trainings and walking training were also included in the planned exercise program. When the results of the study were examined, it was observed that there was an increase in the range of motion and muscle strength of the hip, knee joint because of the stretching and strengthening exercises. We think that this situation may have contributed to reducing the intensity of pain and increasing the functional level of the individual. Initially, increasing pain intensity during activity affected the development of kinesiophobia, but the decrease in pain instensity with exercise reduced the fear of movement. With the increase of functionality and decrease of kinesiophobia, the patient began to forget about his artificial joint and developed joint awareness.

Physiotherapists, who are part of the team in complex surgeries such as arthroplasty, should know the recovery stages at every stage of the treatment and plan a suitable physiotherapy program to ensure their functional gains. Physiotherapists are healthcare professionals who have the ability to identify the deficiencies of the patient in performing that function by analyzing a function in parts. Therefore, the inclusion of a physiotherapist in the team to restore post-surgical functions can have positive results. The fact that physiotherapy was started after the operation in the hospital where our patient had a surgical operation had a great effect on the patient's return to his normal life. In addition, since the patient's ability to regain her social role is the ultimate goal of rehabilitation, physiotherapists may also need guidance in returning to work or learning a new job. Further studies involving more cases are needed to obtain more comprehensive results.

## CONCLUSION

These results obtained in our case can be interpreted as the results of a successful physiotherapy application. It is thought that the 8-week physiotherapy program, which is planned for the patient, will contribute to the functional return of the patient.

**ACKNOWLEDGEMENTS**
No

**FUNDING**
No

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