



The Effects of Early Kinesitherapy to Strengthen the Musculature and Reduce Pain After Implantation of Hip Endoprosthesis

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Abstract

Introduction: The development and implantation of artificial joints is one of the greatest achievements in medicine. Globally, the most often replaced natural joint with artificial one is the hip joint. Depending of the age of the patient, the doctor sets the indication for the type of endoprosthesis that will be implanted. We differentiate the total (TEP) and partial (PEP) endoprosthesis of the hip. Modern methods of making endoprosthesis enables rapid postoperative recovery and complete disappearance of pain which was present before the surgery. Recovery and rehabilitation is also significantly shortened with significantly increased patients functionality.

Aim: The aim of this study is to analyze the effects of early kinesitherapy to strengthen the musculature and reduce the pain after implantation of hip endoprosthesis.

Materials and Methods: This study is a clinical retrospective-prospective study. The study included a total of 33 patients hospitalized at the Clinic for Physical Medicine and Rehabilitation at the Clinical Centre University of Sarajevo in the period from 01.01.2017. to 01.05.2018.

Results: From the total number of 33 patients, 26 (78.8%) of them were females and 7 (21.2%) were males. Most patients were in the group of 71-80 year, a total of 12 patients or 36.4%, and at least in the groups below 50 years and in the group 50-60 year a total of 2 patients or 6.1%. The average duration of hospitalization was 20.21 ± 8.41 days. For 23 patients (69.7%), this was the first operation, and for 8 (24.2%) patients this was the second operative procedure. Of the total number of patients in 17 patients (51.5%) DHS is implanted, PEP in 9 patients (27.3%), TEP in 6 patients (18.2%), one patient (3%) was treated conservatively. Statistical analysis showed a statistically significant difference between the recorded muscle strength score of operatively treated extremity, by the manual muscle test (MMT) at admission and discharge after the performed rehabilitation ($p < 0.05$), as well as the statistically significant difference between the recorded pain score on admission and discharge by VAS scale after a recent early kinesitherapy ($p < 0.05$).

Conclusion: Early kinesitherapy after orthopedic surgical treatment of hip endoprosthesis directly affected muscle strengthening and pain reduction, and consequently led to improved patient quality of life.

Keywords: Kinesitherapy; Endoprosthesis; Manual Muscle Test; Visual Analogue Scale

Abbreviations

OA: Osteoarthritis; MMT: Manual Muscle Test; VAS: Visual Analogue Scale; DHS: Dinamic Hip Screw; TEP: Total Endoprosthesis; PEP: Partial Endoprosthesis.

Introduction

The development and implantation of artificial joints is one of the greatest achievements in medicine and in the XX. Century and in orthopedics. Globally, the most often replaced natural joint

with artificial one is the hip joint. The first endoprostheses have been implanted from the early twenties of the last century and it is generally considered as one of the most successful orthopedic operations. Number of hip joint fractures in the future could increase to more than 6 million annually. Because of hip fracture, patients spend in the hospital more days than for any other musculoskeletal injuries [1]. Due to the hip injury older patients spend 2/3 of all hospital days. The previous positive experience in implantation of prosthesis affect the quality of prosthesis and increasing application. We differentiate the total (TEP) and partial (PEP) endoprosthesis of the hip [2]. Recovery of patients depends on several factors, and is carried out by known protocols. As a result of the early involvement of the rehabilitation team in rehabilitation, it significantly shortens and significantly increases the patient's functional capacity. The first endoprostheses have been implanted since the early twenties of the last century and are generally considered to be one of the most successful orthopedic operations. If there was no fracture, which is an urgent indication for one of the operations of the hip, endoprosthesis is implanted after OA which can not be cured by conservative treatment [3]. Sometimes the pain is so strong that the patient has to take significant doses of analgetics and non-steroidal anti-inflammatory drugs on a daily basis, as well as if the ability to walk is greatly disturbed. Depending on the age of the patient, the doctor sets the indication for the type of endoprosthesis that will be implanted [4]. Modern methods of making endoprosthesis enables rapid postoperative recovery and complete disappearance of pain present before surgery [5]. The most serious consequences can occur after the hip fracture [6]. Therefore, the most common causes of endoprosthesis implantation include: wear and tear of the hip joint, trauma (fractures and dislocations), insufficient development of the hip joint, rheumatoid arthritis or similar diseases [7]. Medical rehabilitation in patients with implanted endoprosthesis has the task of providing faster recovery and training for daily activities. It is necessary to start as soon as possible and it must be individually adapted to each patient. For this reason, on the first day of surgery, patients are being trained to perform isometric exercises in bed (if there is no contraindication for this type of exercise) [8]. Kinesitherapy is a mandatory part of rehabilitation. It affects the increase in muscle strength, improves range of motion in the joints, contributes to physical stability and prevents physical disability. Kinesitherapy also has a beneficial effect on bone architecture, and therefore on the stability of the body [9]. In this way, the pain that preceded the operation was reduced, whether it was a result of degenerative changes in the hip, some other disease, or pain caused by hip injury.

The aim of the research

To analyze the effects of early kinesitherapy to strengthen the musculature and reduce pain after implantation of hip endoprosthesis.

Materials and Methods

This study is a clinical retrospective-prospective study. The study included a total of 33 patients hospitalized at the Clinic for Physical Medicine and Rehabilitation, Clinical Centre University of Sarajevo in the period from 01.01.2017. to 01.05.2018. years. All patients were previously treated at the Clinic for Orthopedics and traumatology. Patients were analyzed in relation to gender, age, the average duration of rehabilitation in our clinic, how many times were surgically treated and how. Motor muscle strength of the operated limb was analyzed by MMT at admission and discharge. Manual Muscle Test is a non-invasive tool used by health professionals to evaluate neuromuscular integrity, and especially muscle strength [10]. The grading system is from 0-5: 0 - no muscular activity (preserved 0% of muscle strength); 1- muscle contraction is present in the tract, and can be palpated or visualized (preserved 15% muscle strength); 2 - muscle is capable of overcoming the full range of movement in the joint, if the force of gravity is excluded (in water, suspension, etc.) (preserved 25% muscle strength); 3 - muscular contraction overcomes the full range of motion without the exclusion of gravitational force (preserved 50% muscle strength); 4 - muscle contraction can overcome the full range of motion against gravitational force with mild resistance (preserved 75% muscle strength); 5 - muscle overcomes the full range of movement with the resistance provided by the therapist (preserved 100% muscle strength) [11].

Intensity of pain is subjective parameter because it evaluates by patients subjective opinion. It is estimated on visual analogue scale (VAS), because of its simplicity. Intensity of pain is evaluated on scale of pain (0-10), where 1 is the least pain, and 10 is the strongest pain [12]. We analyzed the values obtained using statistical parametric tests (chi-square test) with a threshold of significance set at 95% ($p < 0.05$).

Results

From the total number of 33 patients, 26 patients (78.8%) were female and 7 (21.2%) of them male. Most patients were in the group of 71-80 year, a total of 12 patients or 36.4%, and at least in the groups below 50 years and in the group 50-60 year a total of 2 patients or 6.1%. The average duration of hospitalization of patients was 20.21 ± 8.41 . For 23 patients (69.7%), this was first op-

eration, and for 8 (24.2%) patients this was second operative procedure. Of the total number of patients in 17 patients (51.5%) DHS is implanted, PEP in 9 patients (27.3%), TEP in 6 patients (18.2%), one patient (3%) was treated conservatively.

Muscle strength by MMT at admission		
Evaluation	Right	Left
1+	1	1
2	1	
2-	1	1
2+	8	8
3	3	10
3-	3	2
3+	3	4
4	9	5
4-	3	1
4+	1	1
Total	33	33

Table 1: MMT at admission.

On admission the most common score for muscular strength (GMS) of the right extremities by MMT was 4 in 9 patients (27.3%) and the lowest rated scores by MMT are 1+, 2, 2 and 4+ per patient (each group 3%). On admission most common score for muscular strength (GMS) of the left extremities by MMT is 3 in 10 patients (30.3%) and the lowest rated scores by MMT are 1+, 2-, 4- and 4+ with one patient (each group at 3%).

Muscle strength by MMT on discharge		
Evaluation	Right	Left
2+	1	0
3	4	5
3-	4	2
3+	5	10
4	8	9
4-	3	3
4+	6	3
5	1	0
5-	1	1
Total	33	33

Table 2: MMT on release.

The most common discharge score for muscular strength (GMS) of the right extremities by MMT is 4 in 8 patients (24.2%) and the lowest rated scores by MMT were 2+, 5 and 5, with one patient

(each group of 3%). At the discharge most common score for muscular strength (GMS) of the left extremities by MMT is 3+ in 10 patients (30.3%), and the lowest rated scores by MMT on discharge is 5- with a single patient (3%).

Statistical analysis showed that there was a statistically significant difference between the recorded muscular strength scores of the surgically treated extremity, whether it is right or left extremity, by the manual muscle test (MMT) at admission and discharge after the early kinesitherapy (p <0.05).

VAS scale at the admission		
Evaluation	Number	Percentage
4	2	6,1
5	5	15,2
6	8	24,2
7	4	12,1
8	8	24,2
9	5	15,2
10	1	3,0
Total	33	100,0

Table 3: VAS scale at the admission.

On admission the most common pain score by VAS was 6 and 8 in the two groups of patients with 8 patients each (24.2%). The third score was the score of 5 and 9 in 5 patients (15.2%), 4 patients (12.1%) rated the pain by VAS scale 7 and one patient evaluated the pain with score 10 by VAS scale (3%).

VAS scale at the discharge		
Evaluation	Number	Percentage
0	11	33,3
1	8	24,2
2	8	24,2
3	4	12,1
5	1	3,0
7	1	3,0
Total	33	100,0

Table 4: VAS scale at the discharge.

The most common score by VAS scale at discharge in 11 patients was 0 (33.3%), then scores 1 and 2 in 8 patients (24.2%), with grade 3 by VAS scale 4 patients rated pain (12, 1%) and 1 patient rated pain by VAS scale with grades 5 and 7 (3%). Statistical analysis showed that there was statistically significant difference

between the recorded pain score on admission and discharge by the VAS scale in patients included in the group and after an early physical kinesitherapy ($p < 0.05$).

Discussion

The prevalence of hip replacement is estimated at 2.5 and it is expected that with the prolongment of the human lifespan the need for hip endoprosthesis will be increased [13]. an der Wees found that female sex is one of the factors for weaker functional outcomes after implantation of endoprosthesis, men are more functional after implantation of endoprosthesis [14]. The same author assumes that the better functioning of men compared to women after total hip arthroplasty associated with differences in health perception [14]. This disease rarely occurs before the age of 40, and the incidence is rapidly growing with years afterwards. Women are more affected than men [15]. This data is consistent with our results. Foley and colleagues conducted a cohort study in North Carolina. The average age was 61.4 ± 9 years, which is not according to our research. In our study, most patients were in the group of 71-80 years total of 12 patients or 36.4% and at least in groups under 50 years [16]. Lee says in his review article that implantation of endoprosthesis of the hip is the most common reconstructive surgery of the hip joint in adults, with nearly one million implants being planned annually around the world. Today, hip replacement procedures dramatically advanced. Hip replacement is a remarkable medical innovation that allows people to walk without pain by reconstructing heavily damaged hip joints [17]. Pain is an unpleasant feeling that follows the etiologically different causes of changes in the hip joint. In our research after conducting of early kinesitherapy, there was a reduction in pain when we analyze the VAS score at the admission, before the operational procedure, and the VAS score on discharge of patient. It is not important whether the surgery is performed on the left or right hip. Less pain led to better functionality of the treated limb. Similar results are reported in literature. Meesen and Associates state that in the world, the number of individuals with implanted hip endoprosthesis increases rapidly. The retrospective study was done on subjects older than 40 years with built-in hip arthroplasty and all respondents have conducted physical therapy. The study was conducted in the Netherlands, and the results are favorable in many patients because they have less pain and better physical functioning at the end of the operation. Especially the results are favorable in the activities of everyday life [18]. Degenerative hip joint diseases, rheumatoid arthritis, other illnesses as well as injuries, affect the mobility of the hip joint.. Patients are doing their best to minimize use of that joint and there-

fore reduces muscle strength measured by MMT. In our research, we evaluated MMT on admission and after early kinesitherapy. Statistical analysis showed that there was a statistically significant difference between the reported muscle strength scores of the surgically treated extremity, whether it is right or left extremity, by the manual muscle (MMT) on admission and discharge ($p < 0.05$). The kinesitherapy program was individual and adapted to each individual. In a randomized study conducted by Kemp and his associates, he states that due to motion and weak muscle strength, it is necessary to include the physical therapy described in this study as semi-individualized. The standardized program is adapted to the individual needs of the patient [19]. In the research carried out by Erlenwein., *et al.* they believe that the pain that persists after hip endoprosthesis implantation is likely to have a significant impact on the daily life of the patient and their quality of life, thus posing a serious question of pre-postoperative and post-operative rehabilitation quality. In a prospective cohort study they state that after hip endoprosthesis implantation only a small number of patients feel mild pain, but moderate to severe pain with functional constraints was rare. The study was conducted on orthopedic department of the Medical School of Hannover in Germany in the period from July to October 2012. The study only included the patients who underwent primary hip endoprosthesis implantation [20]. As our study showed the pain measured by the VAS scale significantly decreased and the function of the operated hip and its overall function was improved. Systematic reviews of studies that deal with this issue have shown that previous studies have confirmed that early kinesitherapy has had a significant effect on muscle strength, better function of the operated hip as well as the body as a whole, followed by improved quality of life. It is recommended to continue further research with precisely defined parameters to be followed [21].

Conclusion

Early kinesitherapy after orthopedic surgical treatment of hip endoprosthesis directly affected muscle strengthening and pain reduction, and consequently led to improved patient quality of life.

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