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The Effects of Continued Rehabilitation After Primary Knee Replacement

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ABSTRACT

Introduction: Tasks of rehabilitation after arthroplasty are to provide painless joint movements, to improve the range of motion, to establish a scheme of walking, to achieve independence in activities of daily living. **The aim** of the study is to determine the effects of continued rehabilitation on the range of the knee motion and reducing the swelling after total knee replacement. **Methods:** The study was conducted from 2011 to 2013 and included 140 patients of both sexes, aged 45 to 85 with implanted endoprosthesis based on primary osteoarthritis. They were divided into two groups, experimental, which after early rehabilitation continued ongoing rehabilitation for a period of three weeks, while the control group after completion of early rehabilitation began rehabilitation two months from the surgery for a period of three weeks. The range of motion in the knee joint and the extent of the knee joint in the medium of patella were measured in both groups during the admission and discharge from rehabilitation. In the experimental group, control measurements were carried out three months after surgery. **Results**: In both groups, there was a significant reduction of the swelling at the discharge in relation to the admission while in the experimental group there was no change on the control of the joint swelling after three months in relation to the release from rehabilitation. In the experimental group, the range of motion of flexion and extension was improved at the discharge in relation to the admission as well as the flexion during the control while the range of motion of extension wasn't significantly changing during the control examination. In the control group, the extension and flexion were significantly improved at the discharge compared to the admission. Comparing both groups, the results showed that there was a significant improvement in flexion movements in the experimental group during rehabilitation in comparison to the control group, while the range of motion of the extension was not significantly different in these two groups. Comparing the range of motion of the experimental group on the control examination and the control group at discharge, it is demonstrated significant improvement in flexion and extension in the experimental group. **Conclusion**: Results of monitoring the reduction of the swelling and the return of the range of motion confirm the advantage of continuous rehabilitation.
Key words: knee arthroplasty, continued rehabilitation.

1. INTRODUCTION

Arthroplasty of the knee joint represents a significant advance in the treatment of severe pathology of the joints, but the treatment does not stop with surgery. The aim is to provide a pain-free movement and thereby improve the patient's quality of life (1). The tasks of rehabilitation after arthroplasty are directed to: painless movements of the operated joint, improving range of motion, establishing the concrete scheme of walk and encouraging independence in activities of everyday life (2). For many years there is a need for determining the effects of continuous rehabilitation after the primary arthroplasty (3) which served as a basis for our research.

2. OBJECTIVE

The aim is to determine the effects of continued rehabilitation of the knee range of motion and reducing of the swelling after the primary arthroplasty of the knee joint.

3. SUBJECTS AND METHODOLOGY

A prospective study was conducted from 2011 to 2013 in The Institute of Physical Medicine and Rehabilitation "Dr Miroslav Zotovic" Banja Luka. 140 patients of both sexes, aged 45 to 85 with implanted endoprosthesis based on primary osteoarthritis, participated. All patients were surgically treated at the Orthopedic ward of the same institution, by the same surgical team and the same surgical technique to retain the cruciatum posterius. After surgical treatment, all patients were conducted through early rehabilitation by the Protocol, after which they were divided into two groups, of 70 patients each, on the basis of whether they go on with continued rehabilitation or had the stationary rehabilitation in the delayed time period. Parameters of exclusion from the study were: acute psychoses, acute thromboses, pulmonary embolism, cardiac and pulmonary decompensation, acute stroke, rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, an advanced stage and hospital clinical osteoarthritis of neighboring joints (hips and contralateral knee). To the first, experimental, group, the range of motion in the knee joint and the extent of the knee joint through the medium of patella were measured after the admission and the discharge from the continuous rehabilitation and three months after surgery. The second, control, group began rehabilitation, on average, two months after the surgery. The above measurements were performed at the admission and the discharge from rehabilitation.

Statistical analysis was done by software package SPSS, version 19.0, using descriptive statistics (± SD, median), non-parametric tests: Mann-Whitney U-test, Wilcoxon Signed Rank Sum test, $\chi 2$ test. The value of $p < 0.05$ was considered statistically significant. The study was approved by the Ethics Committee of The Institute of Physical Medicine and Rehabilitation "Dr Miroslav Zotović", Banja Luka.

4. RESULTS

The extent of the knee measured through the medium of patella

The average value of the extent of the knee in patients of the experimental group, at the admission, amounted to 46.o4 ± 3.96 cm, 43.74 ± 3,72 at the discharge, and at the control, three months after surgery 44.09 ± 4.12 cm. The analysis showed that there is a statistically significant difference between the results of $p < 0.01$, measured on the admission and at the discharge, while there was no statistically significant difference $p < 0.05$, in the measurement values at the discharge and the control three months after the surgery.

The average value of the extent of the knee in patients of the control group, at the admission, amounted to 44.73 ± 4.06 cm, at the discharge 43.98 ± 4.03 cm. The analysis showed that there is a statistically significant difference p < 0.01 of the results measured on the admission and the discharge.

Parametres	N	M	SD	MIN	MAX	P value
The extent of the knee–cm–admission	70	46.04	3.96	38.50	55.00	0.00
The extent of the knee–cm–discharge	70	43.74	3.72	37.50	52.50	

Table 1. Experimental group: The extent of the knee (medium of patella – cm) admission / discharge

Parametres	N	M	SD	Minimal value	Maximal value	P value
The extent of the knee–cm–discharge	70	43.74	3.72	37.50	52.50	0.077
The extent of the knee–cm–/ 3 months	70	44.09	4.12	37.00	57.00	

Table 2. Experimental group: The extent of the knee (medium of patella – cm) discharge/control after three months

Parametres	N	M	SD	Minimal value	Maximal value	P value
The extent of the knee–cm – admission	70	44.73	4.06	33.00	55.50	0.000
The extent of the knee–cm–discharge	70	43.98	4.03	32.50	50.00	

Table 3. Control group: The extent of the knee (medium of patella – cm) admission / discharge

The analysis of the above - shown results showed that the pace of reduction of swelling of the knee joint was greater in the experimental group.

Range of motion (flexion and extension) of the knee joint

The average value of the flexion movements in patients of the experimental group amounted to 50.07° ± 12,754°at the admission, while at the discharge was 88.40° ±13,834°. In the control, three months after the surgery, the flexion amounted to 95.28° ± 13.83°. The analysis showed that there is a statistically significant difference $p < 0.01$, the results measured on the admission and the discharge as well as in the three - months control after the surgery.

The average value of the extension movements in patients of the experimental group amounted to -2.94° ± 5,359° at the admission, while at the discharge was -0.71° ± 2,100°. In the control, three months after the surgery, the extension amounted to–0.89° ± 2.80°. The analysis showed that there is a statistically significant difference $p < 0.001$, in the values of extension measured on the admission and the discharge while there was no statistically significant difference in the value of the extension movements at the discharge and the control three months after the surgery.

The average value of the flexion movements in patients of the control group amounted to 72.93 ± 16,163 at the admission, while at the discharge was 89.30° ± 13,044.

		N	M	SD			N	M	SD
	admission	70	50.07	12.754		admission	70	-2.94	5.359
Flexion	discharge	70	88.40	13.834	Extension	discharge	70	-0.71	2.100
	control / 3 months	70	95.29	13.83		control / 3 months	70	-0.89	2.800

Table 4. Experimental group: Flexion/extension at the amisson, discharge and control three months after the surgery

		N	M	SD			N	M	SD
Flexion	admission	70	72.93	16.163	Extension	admission	70	-3.79	5.574
	discharge	70	89.39	13.044		discharge	70	-1.81	3.245

Table 5. Control group: Flexion/extension at the amisson and the discharge

The analysis showed that there is a statistically significant difference $p < 0.001$ results measured on the admission and the discharge.

The average value of the extension movements of this group of patients amounted to -3.79 ± 5.57 at the admission, while at the discharge was -1.81 ± 3.24. The analysis showed that there is a statistically significant difference $p < 0.001$ results measured on the admission and the discharge.

The analysis showed that there is a statistically significant difference between progress of the experimental and the control group in the values of flexion $p < 0.001$; the average difference in the value of flexion at the discharge compared to the admission was higher in patients in the experimental group than in patients in the control group and they showed a bigger and better progress. There was no statistically significant difference between the progress of the experimental and the control group in the extension, $p > 0.05$. Further analyses were comparing the value of flexion and extension movements of the experimental group three months after surgery and the control group at the discharge from rehabilitation which represent identical time span from the surgery of both groups. It showed that there is a statistically significant difference between the experimental and the control group in flexion. It was established that in the measured period from surgery, flexion was significantly higher in the experimental group than in the control group of patients, $p < 0.01$ and that there is a statistically significant difference between the experimental and control groups in extension. It was established that in the measured period from surgery, extension was significantly higher in the experimental group than in the control group of patients, $p < 0.05$.

5. DISCUSSION

There is a constant question when to start and how long to conduct the post-operative rehabilitation after implantation of total knee joint endoprosthesis so that we could, in the shortest period of time, get the full functional capacity of the patient. There is a question - if on already accepted and confirmed early rehabilitation (4, 5) go on with the continuous stationary rehabilitation at the specialized centers or to give patients the space to adapt to their lives at home, and then, after a couple of months, conduct stationary rehabilitation? This was the motive to the start this study. The aim of the postoperative rehabilitation is: to reduce the pain, swelling, inflammation, possibility of thrombotic complications, to re-establish a normal range of motion in the treated joint, to return and increase the power of the flexor and extensor of the knee, to reach the appropriate motor patterns and to improve the general physical capacity (6). Our study was designed in a way that the two groups, the experimental one and the control one, conducted the early rehabilitation, after which the experimental group went on with continued rehabilitation which lasted, on average, 21 days in the specialized ward, while the control group, on average, after a period of two months, was admitted to rehabilitation, also for a period of time of 21 days in the same ward as the previous one. One of the most important goals is to eliminate the swelling that does not allow full involvement in the return of the range of motion. Our results showed that there is a difference in the extent of the knee, measured over the medium of patella, which is an indication of the withdrawal of the swelling at the discharge compared to the admission in patients of both groups, but the reduction of the swelling was greater and more significant in the experimental group. In the first group, on the control after three months there were no significant changes. The researchers (3) came to the similar results following the patients who had the knee arthroplasty, 6 weeks, 3 months, 6 months and 12 months after their surgery and they emphasize the need for continuous post-operative rehabilitation. Group of authors (6) also found that the positive results of the surgical treatment and rehabilitation are noticed quite early, but in the fourth postoperative week, which is significant evidence that the treatment was effective.

The question was whether the waiting time for rehabilitation affects on the range of motion of the knee with a total endoprosthesis implantation? The results of measurements of the range of motion, flexion and extension showed a significant difference in the same in both groups on the discharge in regard to the admission, while in the experimental group was some improvement three months after the surgery regarding the move of flexion, but not the extension, where we gave the answer to the question: „Can the functional status that affects on the range of motion of the knee, three months postoperatively after the total knee arthroplasty, be predicted from data collected after active rehabilitation?“ (7). It is of great importance, as it is confirmed by the authors (8), to send the patients, after the total knee arthroplasty, in the short physiotherapy treatment in order to provide short-term benefits. Finally, comparing the results of the ex-

perimental group after three months, and control group at the discharge from rehabilitation, which is for both groups the same time after the surgery, it shows a significant improvement in the experimental group, which confirms the importance of continuous rehabilitation.

6. CONCLUSION

Results of the monitoring of the reduction of swelling and the return of the range of motion after knee arthroplasty confirm the advantage of continuous rehabilitation. Further research will be followed by other indicators of functional recovery and quality of life of patients after such surgical interventions.

- Competing interests: none to declare.

REFERENCES

1. The WHOQOL Group. The World Health Organisation Quality of Life Assessment (WHOQOL): development and general psychometric properties. Soc Sci Med. 1998 Jun; 46(12): 1569-85.
2. Nilsdotter AK, Toksving-Larsen S, Ross EM. Knee arthroplasty: are patients' expectations fulfilled? A prospective study of pain and function in 102 patients with 5-year follow-up. Acta Orthop. 2009 Feb; 80(1): 55-61.
3. Papakostidou I, Dailiana ZH, Papapolychroniou T, Liaropoulos L, Zintzaras E, Karachalios TS, et al. Factors affecting the quality of life after total knee arthroplasties: a prospective study. BMC Musculoskelet Disord. 2012 Jun 29; 13: 116.
4. Beswick DA, Wylde V, Gooberman-Hill R, Blom A, Dieppe P. What proportion of patients reported long-term pain after total hip or knee replacement for osteoarthritis? A systematic review of prospective studies in unselected patients. BMJ Open. 2012 Feb 22; 2(1): e000435.
5. Lenssen AF, Crijns IHF, Waltje EMH, Roox GM, van Steyn MJ, Geesink RJ. et al. Effectiveness of prolonged use of continuous passive motion (CPM) as an adjunct to physiotherapy following total knee arthroplasty: design of a randomised controlled trial BMC Musculoskelet Disord. 2006 Feb 23; 7: 15.
6. Gawel J, Fibiger W, Starowicz A, Szwarczyk W. Early assessment of knee function and quality of life in patients after total knee replacement Ortop Traumatol Rehabil. 2010 Jul-Aug; 12(4): 329-37.
7. Cosbie J, Nayor J, Harmer A, Russel T. Predictors of functional ambulation and patient perception following total knee replacement and short-term rehabilitation. Disabil Rehabil. 2010; 32(13): 1088-98.
8. Minns Lowe CJ, Barker Kl, Dewey M, Sackley CM. Efectivness of physiotherapy exercise after knee arthroplasty for osteoarthritis: systematic review and meta analysis of randomised controlled trials. BMJ. 2007 Oct 20; 335(7624): 812.