

## **PRACTICAL EFFICIENCY OF ACTIVE PHYSIOTHERAPY AND PASSIVE MOTION AFTER TOTAL KNEE REPLACEMENT**

*(Research note)*

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### **Abstract**

*The aim of this study was to determine the practical efficiency of physiotherapy program after total knee replacement. The sample included 50 patients in two experimental groups /with 25 patients in each/, 13 males and 37 females. In the first experimental group we did in physiotherapy program predominantly active exercises, in the second experimental group – passive motion and CPM. The patients into the two groups were separated in three periods of it individual recovery - maximal protective /early postoperative/ period, middle protective /late postoperative/ period and minimal protective /training/ period. After analyzing the outcomes of measures /ROM, swelling resobtion, tight, shank and knee joint rounds/, we concluded that the physiotherapy program with active motions is better than the physiotherapy program based on passive motion and CPM in total knee replacement patients.*

**Keywords:** *physiotherapy program, males, females, healing gymnastic, experimental groups, active exercises, CPM, electrotherapy, health massage and cryotherapy, anthropometry measures,*

### **INTRODUCTION**

Diseases of the knee joint make many people in active age disabled in daily active work. This is the reason many people visit the orthopedics and hospital consulting offices each year (Ganchev, 1997).

Since years the hip and knee pathologies are around the most problematical areas in development of the orthopedic science. The reason for this is particularly role in bio mechanic of the locomotion and work ability (Barakova, 2003)

The total knee arthroplasty of the knee joint in a short line of time in medicine has indicated magnificent progress in the striving of orthopedic science to create painless and mobile, actively participating joint in locomotory (Matzen, 2000; Melutosh, 2011; Rand, 1993).

Despite of the total knee arthroplasty there is not the long /more than 200 years/ hip replacement story, the innovations about diagnostic, treatment, metals knowledge and engineering happen richer and wide. This is not what a fact for the physiotherapy after total knee replacement. The purpose of this article is defines by these facts.

The purpose of the next article is to determine the practical efficiency of physiotherapy program after total knee replacement.

### **METHODS**

In 2011 – 2013 year we made an investigation on patients with total knee replacement, who visited the physiotherapy section in RSCM 1 in Pleven, Bulgaria. This studying shows that every fourth patient had down limb injury, degenerative or skin – muscles problems and other.

Almost every seventh patient has been with problems in the most burden in human body joint – the knee joint. There are includes knee osteoarthritis, knee meniscuses and ligaments injures, fractures and luxations in this district, rheumatic diseases and other. The total knee arthroplasty is 2.33% of leg patologic, but our experience show that the functional recovery after total knee replacement is connecting with continuous physiotherapy and sometimes provoke different complications. In our previous investigation the total knee replacement was a small percentage /0.24% in 2003y., to 0.64% in 2007y./. For the period 2011y – 2013y this percentage is 17.5. We think that the reason for the small number patients with total knee replacement is unpopularity of this kind of surgery in Bulgaria. Other reason for the small number of patients with total knee arthroplasty was the financial problems with Bulgarian Health System, which does no pay for interventions such a joint replacement.

Only for 10 years the total knee replacement is de-

Table 1. Own material /patients who has been rehabilitated

Year	Common number patients	Leg pathologies	Knee pathologies	Total knee replacements
2011	644	192	107	15
2012	684	170	102	15
2013	816	137	76	20
Patients / %	2144	499 / 23,3%	286 / 13,34%	50 / 2,33%

velop very fast and now we can say that is just “routine” procedure. Desert for this fact have big Bulgarian orthopedics professionalism and in part Orthopedics and Traumatology Clinic in Medicine University – Pleven and Orthopedics and Traumatology Section in Ruse Hospital. This determines the reason for higher % of patients with total knee arthroplasty – 17.5% for the 2011 – 2013 year.

The effect of physiotherapy we retrace with some anthropometric changes results analysis after physiotherapy procedures. Our patients were 50 people – 13 male on average 67.2 ages and 37 female on average 62.5 ages. For every patient we prepared an individual physiotherapy program that was alerted with each period of recovery after total knee replacement.

About this article we separated the patients into two experimental groups / with 25 patients in each/.

The two group physiotherapy programs were different only in the part of healing gymnastic. The common elements in it can show as:

In **maximal protective period** /early postoperative period/ around a month after operation included into two groups: cryotherapy, caring a compressive sock for intravenous depression, prevention and swelling reduce, active and active – assisted exercises /with physiotherapist help/ for the whole surgery leg and knee joint.

For the first experimental group the standard physiotherapy program continuous with isometric contractions series for m.quadriceps femoris, m.biceps femoris, m.semitendinosus, m.semitendinosus, ankle’s plantar flexion muscles, tractus iliotibialis. We include stretching in the end of period. Range of motion from S:0 – 10 – 60 to S:0 – 0 – 90 was satisfy us.

The physiotherapy program in the second experimental group in the basic part included passive motion and CPM series in total knee replacement joint. We tried to reach the range of motion to S: 0 – 0 – 90 earlier than the first experimental group.

Electrotherapy in the two experimental groups was only low frequency impulsing field.



Pic.1 Total knee replacement rentgenografy pictures



Pic.2 Total knee replacement rentgenografy pictures



Pic. 3 Health massage and cryotherapy



Pic. 4 Health massage and cryotherapy



Pic. 6 Passive motion and post – isometric relaxing

**Middle protective period** is from the end of the first to the end of the third month after joint replacement surgery. The physiotherapy program in this period consisted of cryotherapy, compressive sock, health massage.

In the first experimental group we applied isometric exercises in series with 10 repetitions /3 or 5 series/, exercises of type “close kinetic chain”, post – isometric relaxing, stretching about inactivated shorten muscles, pulitherapy with small heavy, in the end – cycling. Range of motion up S: 0 – 0 – 90 (100) was satisfy us.

For the second experimental group we used arthro-mode passive motion, the number of it increasing and we made it 2 – 3 times daily. We tried to gain the range of motion to S: 0 – 0 – 100 (110).

The **minimal protective period** /three months and

more after surgery/ was consisted of the same exercises such as previous period but with bigger range of motion and bigger load. The purpose in this period of recovery after total knee replacement was to create a strong



Pic. 7 Isometric contraction exercise and active exercise



Pic. 5 Passive motion and post – isometric relaxing



Pic. 8 Isometric contraction exercise and active exercise

Table. 2 Leg centimeters /in cm./

Index	<b>Surgery leg</b>				<b>Health leg</b>	
	First experimental group		Second experimental group		First experimental group	Second experimental group
	Start	End	Start	End	Start	End
Tight	49,5	52	50	51	53	51,5
Shank	38,5	39	39	39,5	42	40
Knee joint	43	40	42,5	41,5	39,5	40,5

muscle complex around the total joint replacement. This provides a functional stability on the knee replacement.

Cryotherapy was replaced by hydrotherapy in this period.

## RESULTS

The outcomes of anthropometry measures (rounds of thigh, shank, knee joint) show the next development.

It is obviously that the same starting outcomes in rounds in the first experimental group in the end of physiotherapy are better than outcomes on the second experimental group. Overcome better surgery leg muscle hypotrophy in patients that doing active exercises, isometric contractions and pultherapy in recovery period. The swelling resorption outcomes are better in the first experimental group. Changes about the thigh rounds are positive in the first experimental group again. According to these outcomes of measures we concluded that the physiotherapy program in the first experimental group with active motion is better and more effective than the physiotherapy program of the second experimental group with passive motion and CPM application. In attitude the changes in a range of motion we determined that the application to passive motion and CPM in the second experimental group in maximal protective period and middle protective period of recovery is responsible to faster gain a range of motion to 105 flexion in starting outcome S: 0 – 10 – 60. These outcomes are measured in the end of middle protective period of recovery. In the first experimental group we succeed to gain a range of motion from S: 0 – 10 – 55 to S: 0 – 5 – 90 in the end of middle protective period. In the minimal protective period it was S: 0 – 0 – 110. These outcomes satisfy us. The coming physiotherapy rehabilitation did not make changes in the outcomes. This fact according to us means that the applying to physiotherapy rehabilitation in later period of recovery using a passive motion is not effective and does not change the outcomes of measures in no one component.

## CONCLUSION

The outcomes of measures in a first experimental group show that the applying of physiotherapy program with big capacity and intensity of isometric training,

provide muscle – tendon complex stability around total knee replacement joint, reduce the pain and swelling. Algorithm of recovery of range of motion demand including in healing gymnastic active and active – assisted exercises, post – isometric relaxation for shorten muscles, stretching and training in “close kinetic chain”. The outcomes indicate that only the mechanic movement on CPM and passive motion are not enough to recovery of total knee replacement. This lay to verify physiotherapy forms in physiotherapy programs. The investigations in district of physiotherapy in knee pathology are proceeding.

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