CHARLES UNIVERSITY IN PRAGUE

FACULTY OF PHYSICAL EDUCATION AND SPORTS

Department of physiotherapy

Case study of physiotherapy treatment of a patient with the diagnose Osteoarthritis and Total Knee replacement

Bachelor's thesis

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Abstract

Title:

EN: Case study of physiotherapy treatment of a patient with the diagnose osteoarthritis and total knee replacement

CZ: Studie fyzioterapeuticke léčby pacienta s diagnózu osteoartritidy a totální koleni endoprotezy

Thesis aim:

The aim of this thesis is to discuss the rehabilitation of a patient after total knee replacement due to osteoarthritis. It is divided into two parts, one theoretical part and one practical part. The theoretical part has emphazied to describe the anatomical structure of the knee, kinesiology, biomechanics and development and disease. The practical part aims to describe the examination procedures, therapy implementations and conclution for the patient in relation to the given diagnose.

Clinical findings:

Pelvic obliquity, restrictions/dysfynction of skin, subcutaneous tissue, fascia and muscles on lower extremities, blockages of patellae and PIP joint, short/taut hipflexor and adductor muscles. Weakness and decreased range of motion in whole right lower extremity in all planes. TrP in quadriceps femoris, adductors of thigh, piriformis and hamstrings. Circumference measurements indicates right foot edema/swelling.

Methods:

Soft tissue technique, post-isometric relaxation, jointplay and Brügger concept with the Thera-band are some of the methods which were implemented during the sessions. Totally 8 therapy sessions were completed.

Result:

The patient showed a remarkable improvement in strength, stability and range of motion through the sessions. Result of the ROM of the knee was 0 degrees of extension and 120 degrees of flexion, 14.02.14.

Conclusion:

Comparison of the results from initial kinesiologic examination and final kinesiologic examination shows us that the patient har improved strength in her lower extremity, her ability to relax in tensed muscles makes us able to better perform the post-isometric relaxation with good result. Gait, flexibility, stability, strength and

decreased tension is some of the main improvements.

The patient could tell that she was satisfied with the implementation and monitoring of her prognosis from day to day. Her prognosis will most likely be that she will reach a good functional level for ADL with her increased activity level.

Keywords:

Rheumatoid arthritis, osteoarthritis, total knee replacement rehabilitation.

Declaration

I hereby declare that this bachelor thesis work is entirely my own, individual work on knowledge from books, articles, journals and by attending seminars and lectures at FTVS.

I also declare that no invasive methods were used during the practical approach and that the patient was fully aware of the procedures at any given time.

Prague, March 2014

Acknowledgement

During my years of education in Prague I have been fortunate to have good friends and close family who have supported me in everything, especially that I choose to take my education abroad. They have always motivated me through phone calls and letters, which has made the distance from home smaller. I greatly appreciate you all for that.

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And at last but not least, I want to show my gratitude towards Mrg. Lenka Satrapová. She has been guiding me through this bachelor thesis. Her support and supervision is very much appreciated.

Thank you!

Lene Moe Sognar
Prague, April 2014

List of content

1 Introduction

This thesis concerns about the theoretical and practical aspect of the diagnose osteoarthritis of the knee, followed by a total knee replacement. Osteoarthritis is a degenerative joint disease which causes pain, stiffness and tenderness for a patient in ADL. After medical treatment, diet planning and exercises the ADL challenges can be considered with the necessity to have a total knee replacement, althougt it is the last choice to make due to the risk of complications. To diagnose the osteoarthritis it is necessary to perform an X-ray of the joint. The represented patient is also affected by rheumatoid arthritis of hands.

The bachelor thesis is divided into two parts – general and special parts. In the general part the theoretical knowledge of osteoarthritis is described with focus on the knee and briefly explained about rheumatoid arthritis. It is subgroups discussing the anatomy, kinesiology and basic biomechanics of the knee. The general part is intended as a brief overview of the knee, diagnoses and total knee replacement.

The specific part is considered to be most important. In this part the examination and therapy progress of a patient with the given diagnose is discussed. The workplacement practice took place in the Revmatologický ústav clinic in Prague, 03-14 february 2014. During the practice, a full examination and therapy implementation was performed. The knowledge used is obtained from the school, Fakulta Tělesné Výchovy a Sportu University Karlovy in Prague during my studies, in cooperation with advisor and supervisor. Both the initial and final kinesiologic examinations containes conclution, carefully description of executed therapy from day to day and evaluation of therapy progress and efficiency. The degrees of successful results is marked green in the final kinesiologic examination. The thesis includes a list of litterature, tables and explanation of abbreviations which can be found in the supplement. Application approval from the ethics board committee and agreement contract with patient is also presented in the supplement.

2 General Part

2.1 Anatomy and kinesiology of the knee

2.1.1 Anatomy

The knee joint is our largest and most superficial joint. It is primarly a hinge type of synovial joint, allowing flexion and extension. However, the hinge movement are combined with gliding, rolling and with rotation about a vertical axis. Relevant anatomical details of the knee joint consist of the articulations tibiofemoral and patellofemoral. Two fibrocartilaginous menisci, one laterally and one medially together with ligaments, synovial membrane, fibrous membrane, muscles and the vascular supply (Drake, 2009).

Articulations, articular surfaces and stability of the knee joint

Two femorotibial articulations is present in the knee joint, lateral and medial. The articulations is between the lateral and medial femoral and tibibal condyles. One intermediate femoropatellar articulation is between the patella and the femur. The knee joint is relatively weak mechanically because of its narrow articular surfaces. The stability of the knee joint depends on the strength and actions of the sourrunding muscles, tendons and ligaments that connect the femur and tibia. The most important muscle in stabilizing the knee joint is the large quadriceps femoris, particularly the inferior fibres of the vastus medialis and lateralis (Moore, 2013).

Joint capsule in the knee joint

The joint capsule in the knee joint is typical in consisting of an external fibrous layer of the capsule, and an internal synovial membrane that lines all internal surfaces of the articular cavity not covered with articular carlilage. Superiorly the fibrous layer attaches to the femur, just proximal to the articular margins of the condyles. The posteriorly fibrous layer encloses the condyles and the intercondylar fossa. Posteriorly to the lateral tibial condyle, the fibrous layer has an opening which allows the tendon of the popliteus muscle to pass out of the jointcapsule and attach to the tibia. Inferiorly the fibrous layer attaches to the margin of the superior articular surface of the tibia. The quadriceps tendon, patella and patellar ligament replace the fibrous layer anteriorly. This fibrous layer is continuous with the lateral and medial margins of these structures, and there is no separate fibrous layers in this region (Moore, 2013).

Ligaments of the knee joint

Extrinsic ligaments:

Anterior side:

- Medial longitudinal patellar retinaculum
- Lateral longitudinal patellar retinaculum
- Medial transverse patellar retinaculum
- Lateral transverse patellar retinaculum

Medial and lateral sides:

- Medial collateral ligament
- Lateral collateral ligament

Posterior side:

- Oblique popliteal ligament
- Arcuate popliteal ligament

Intrinsic ligaments:

- Anterior cruciate ligament
- Posterior cruciate ligament
- Transverse ligament
- Posterior meniscofemoral ligament (Schulte, 2006)

Meniscus

There are two menisci, which are fibrocartilaginous C-shaped cartilages in the knee joint, one medial meniscus and the lateral meniscus. They are both attached in the intercondylar region of the tibial plateau. The medial meniscus is attached around its margin to the capsule of the joint and to the tibial collateral ligament whereas the lateral meniscus is unattached to the capsule. Therefor, the lateral meniscus is more mobile than the medial meniscus. The menisci are interconnected anteriorly by a transverse ligament of the knee. The lateral meniscus is also connected to the tendon of the popliteal muscle, which passes superiolaterally between this meniscus and the capsule to insert on the femur (Drake, 2009).

Bursae

We have several burase arranged around the knee joint, the bursae which is in constant communication with the kneejoint include the suprapatellar bursae,

subpopliteal recess, semimembranosus bursae and medial subtendinosus bursae (Maeurer, 2006).

Muscles of the knee and innervations

Muscles	Origin	Insertion	Innervation
Flexors of the knee:			
Biceps femoris	Ischial tuberosity and linea aspera of femur	Head of fibula, lateral condyle of tibia	Sciatic nerve: tibial portion (S1-S3, to long head) and common fibular branch (L5-S2 to short head.
Semitendinosus	Ischial tuberosity	Proximal, medial surface of tibia	Sciatic nerve (tibial portion L5-S2)
Semimembranosus	Ischial tuberosity	Posterior surface of medial condyle of tibia	Sciatic nerve (tibial portion L5-S2)
Sartorius	Anterior superior iliac spine	Medial surface of tibia, close to tibial tuberosity	Femoral nerve (L2-L3)
Popliteus	Lateral condyle of femur	Posterior surface of proximal tibial shaft	Tibial nerve (L4-S1)
Extensors of knee:			
Rectus femoris	Anterior inferior iliac spine and superior acetabular rim of ilium	Tibial tuberosity via quadriceps tendon, patella and patellar ligament	Femoral nerve (L2-L4)
Vastus lateralis	Anterior and inferior to greater trochanter of femur and along linea aspera (proximal	Tibial tuberosity via quadriceps tendon, patella and patellar ligament	Femoral nerve (L2-L4)

	half)		
Vastus intermedius	Anterolateral surface of femur and linea aspera (distal half)	Tibial tuberosity via quadriceps tendon, patella and patellar ligament	Femoral nerve (L2-L4)
Vastus medialis	Entire length of linea aspera of femur	Tibial tuberosity via quadriceps tendon, patella and patellar ligament	Femoral nerve (L2-L4)

Table 1 Muscles of the knee and innervations, (Martini, 2005)

Blood supply and innervation to the knee

The arteries supplying the knee joint are ten vessels that form the periarticular genicular anastomoses around the knee. The genicular branches of the femoral and popliteal arteries is a part of the network forming the arteries sourrounding the knee joint. The middle genicular branches of the popliteal artery penetrate the fibrous layer of the joint capsule and supply the cruciate ligaments, synovial membrane and peripheral margins of the meniscus (Moore,2013).

2.1.2 Kinesiology

Movements of the knee joint

As mentioned, the main knee movements are flexion and extension, some rotation occurs when the knee is flexed.

Physiological range of motion in knee:

Movement	Extension	Flexion	Medial rotation	Lateral rotation
Degrees	0	120 (hip extended) 140 (hip flexed) 160 (passively)	10 (knee flexed) 5 (knee extended)	30

Table 2 Physiological range of motion of the knee joint (Moore, 2013)

When the knee is fully extended with the foot on the ground, the knee passively "locks" because of medially rotation of the femoral condyles on the tibial plateau, a

term used for this is the “screw home” mechanism in the extended knee. This position makes the lower limb a solid column and more adapted to weight-bearing. When the knee is locked the thigh muscles and leg muscles can relax briefly without making the knee joint too unstable. To unlock the knee the popliteus contracts, rotating the femur laterally about 5 degrees on the tibial plateau so that flexion of the knee may occur (Moore, 2013).

In the flexed knee, rotation is possible under the control of the cruciate ligaments. The medial rotation movement in the knee joint is less than the lateral rotation. During medial rotation of the tibia, the cruciate ligaments are twisted around each other, and in lateral rotation the cruciate ligaments become unwound. The limit for lateral rotation is primarily determined by the tibial collateral ligament (Platzer, 1978).

The patellofemoral joint motion in flexion and extenstion in the knee is gliging movements inferiorly and superiory agains the distal end of the femur with an excursion of approximately 7 cm. (Iranpour, 2010). Tracking of the patella against the femur depends on the direction of the net force produced by the attached quadriceps muscle. The vastus lateralis tends to pull the patella laterally, while the vastus medialis oblique opposes the lateral pull of the vastus lateralis, keeping the patella centered in the patellofemoral groove. The medial and lateral quadriceps force components also tilt the patella in the sagittal and transverse planes (Lin, 2004). The iliotibial band influences knee mechanics aswell, and excessive tightness can cause maltracking of the patella (Merican, 2009).

2.2 Biomechanics of the knee

2.2.1 Forces at the tibiofemoral joint

The tibiofemoral joint is loaded in both compression and shear during daily activities. Weight-bearing and tension development in the muscles crossing the knee contribute to these forces, with compression dominating when the knee is fully extended. Compressive force at the tibiofemoral joint has been reported to be slightly greater than three times body-weight during the stance phase of gait, increasing up to approximately four times body-weight during stair climbing (Kettlekamp, 1972). The medial tibial plateau bears most of this load during stance when the knee is extended, with the lateral tibial plateau bearing more of the much smaller loads imposed during the swing phase (Winby, 2009). Since the medial tibial plateau has a surface area roughly 60% larger than that of the lateral tibial plateau, the stress acting on the joint is

less than if peak loads were distributed medially (Kettlekamp, 1972). The fact that the articular cartilage on the medial plateau is three times thicker than the lateral plateau also helps protect the joint from wear. The menisci act to distribute loads on the tibiofemoral joint over a broader area, thus reducing the magnitude of joint stress. The menisci also directly assist with force absorption at the knee, bearing as much as estimated, 45% of the total load (Shrive, 1978).

Measurements of articular cartilage deformation on the tibial plateau during weight-bearing show that stress on the joint is maximal from 180 to 120 degrees of flexion, with minimal stress at approximately 30 degrees of flexion (Bingham, 2008). The higher load due to high body-mass index is a general risk factor for development of knee osteoarthritis and meniscal damage (Roemer, 2009).

2.2.2 Forces at the Patellofemoral Joint

Compressive force at the patellofemoral joint has been found to be one-half of body weight during normal walking gait, increasing up to over three times body-weight during stair climbing (Reilly, 1972). Patellofemoral compression increases with knee flexion during weight-bearing. There are two reasons for this, the first, increase in knee flexion increases the compressive component of force acting on the joint. Second, as flexion increases, a larger amount of quadriceps tension is required to prevent the knee from buckling against gravity (Hall, 1999).

2.3 Osteoarthritis of knee

2.3.1 Caracterization

Artrithis is a inflammation of a joint, a general inflammation that includes soft tissue effects. The inflammation can come as a result of trauma as well as of bone and joint infections. Osteoarthritis, the most common form of arthritis, is characterized by destruction of the articular cartilage in a joint and formation of adjacent bone. Another term for this phenomen is degenerative joint disease (White, 2011).

Osteoarthritis is a chronic condition which can cause pain, stiffness and swelling of the affected joint (Arden, 2008). The disease occurs mostly in load-bearing joints, particularly in the spine, the hips and the knees, less commonly it affects the hands, feets, elbows and shoulders, and it is an inherent part of the aging process (White, 2011).

2.3.2 Etiology

The causes of this disease are, for the most part, mechanical (White, 2011). Our understanding to the mechanisms is that excessive biomechanical loading due to injury, accident or overuse and abnormal biomechanical properties of joint tissue, such as cartilage, subchondral bone or a combination of these factors play a role in the pathogenesis of osteoarthritis. The exact etiology of osteoarthritis is unknown (Swank, 2010). Osteoarthritis is usually classified as eighter primary (idiopathic), resulting from a combination of factors that include age, sex, hormones, mechanical stress and genetic predisposition (White, 2011), or secondary, to metabolic conditions, anatomical abnormalities, trauma or inflammatory diseases (Moskowitz, 2007). Disease evolution in knee osteoarthritis is slow, usually taking several years. There is emerging evidence that once established, the condition can remain relatively stable for many years (Arden, 2005).

2.3.3 Epidemiology

Osteoarthritis is the most common disease of joints in adults worldwide. One-third of all adults have radiological signs of osteoarthritis. Knee osteoarthritis is the most common type (6% of all adults). The likelihood of developing osteoarthritis increases with age (Felson, 1987).

2.3.4 Clinical features

Symptomes of osteoarthritis varies greatly from persom to person. Some people can be debilitated by their symptomes. Whereas other may have remarkable few symptomes in spite of the dramatic degeneration of their joints shown on X-rays. Symptomes can also be intermittent. It is not unusual for patients with osteoarthritis of the hands and knees to have years of pain-free intervals between symptomatic episodes. The severity of symptomes in osteoarthritis is greatly influenced by a persons attitude, anxiety, depression or daily activities. The symptomes and signs of osteoarthritis will also be varry depending on the joint affected. The main symptomes associated with osteoarthritis are stiff and painful joints which impacts on your day to day function, reduction or altered range of motion, pain, stiffness, tenderness, crepitus, swelling and muscle weakness (Arden,2008).

2.3.5 The staging of osteoarthritis of the knee according to Kellgren and Lawrence

Stage 0 - no abnormality

Stage 1 - incipient osteoarthritis, beginning of osteophyte formation on eminences

Stage 2 - moderate joint space narrowing, moderate subchondral sclerosis

Stage 3 - >50% joint space narrowing, rounded femoral condyle, extensive subchondral sclerosis, extensive osteophyte formation

Stage 4 - joint destruction, obliterated joint space, subchondral cysts in the tibial head and femoral condyle, subluxed position

Surgery is indicated only when all conservative measures have been tried without success, in patients with advanced osteoarthritis and severe subjective impairment from their symptoms (Felson, 1987).

2.4 Rheumatoid arthritis

2.4.1 Caraterization

Rheumatic arthritis is an inflammatory disease of the soft sling membrane lining the joint cavity. The synovial tissue becomes swollen and inflamed, which eventually leads to cartilage breakdown and joint destruction. Rheumatoid arthritis is considered an autoimmune disease (Brugioni, 2004).

Middle-aged women have a predisposition for rheumatoid arthritis. In rheumatoid arthritis, the immune system of the body attacks its own cartilage. Bone changes are atrophic and are especially focused in the hands and feet. The lesions are usually bilaterally symmetrical (White, 2011).

The pathological changes in rheumatoid arthritis include thickening of the synovial lining of the joint cavity, infiltration of the sublining layer of the synovial tissue by lymphocytes and monocytes, and destruction of cartilage by an ingrowth of connective “pannus” tissue (Cutolo, 2011).

2.4.2 Etiolgy

The cause of rheumatoid arthritis is unknown, although some researches have theorized that it may be related to a viral infection or to invironmental factors that have yet to be determined (Brugioni, 2004).

2.4.3 Epidemiology

Although arthritis is a common disease in adults, only one in five new cases of arthrities is classifiable as rheumatoid arthritis. The annual incidence of adult rheumatoid arthritis is about 0.05 percent, and is ten times higher among women over fifty than among men. The prevalence increases with age up to 70 years, after which it declines due to premature mortality. The high or low prevalences characteristic of certain populations may be explained by ethnic differences in genetic susceptibility (Isomäki, 1993).

2.4.4 Signs and symptoms

Pain, inflammation and fatigue are symptoms that often occur when rheumatiod arthritis. Typical disease signs of arthritis is inflammation of the joints, pain, stiffness and swelling. Blood samples is used to detected rheumatoid factor in the blood. The test is positive in 70-80% of patients with arthritis (Sørfonden, 2011).

2.5 Total knee replacement

2.5.1 Introduction and indications for total knee replacement

The doctor may recommend knee replacement surgery if a patient have severe knee pain and disability from rheumatoid arthritis, osteoarthritis, or traumatic injury. A knee replacement can relieve pain and help the patient live a fuller, more active life. During the surgery, an orthopaedic surgeon will replace your damaged knee with an artificial device (implant). Although replacing the total knee joint is the most common procedure, some people can benefit from just a partial knee replacement. Implants are made of metal alloys, ceramic material, or strong plastic parts, and can be joined to your bone by acrylic cement. There are many different types of implants. The surgeon will discuss with the patient the type of implant that best meets the patients needs (Malhotra, 2010).

2.5.2 Contraindications

The underlying cause of stiffness of the knee must be carefully evaluated when considering the risk and benefits of the procedure. This is always difficult and a potentional source of complications. Although there is always difficulty in determining which complications are related directly to an ankylosed and stiff knee, and which are related to the patients underlying disease. Some conditions should discourage the

surgeon to perform the total knee replacement, like reflex sympathetic dystrophy, poor neuromuscular condition, inedequate bone quality and low-grade sepsis (Bonnin, 2008).

2.5.3 Clinical presentation

The clinical history in a patient with arthritis of the knee is dominated by pain. This predominantly occurs in weight-bearing, but in the end stages may be constant and unrelieved by rest. Night pain is a particularly disabling symptom that demands urgent attention. The pain may be localised to one compartment or maybe diffuse. Other symptoms include stiffness, swelling, locking and giving way. It is useful to try and quantify the level of pain on a simple scale and to assess how the patient's activities of ADL is affected. The patient should be asked questions on maximum walking distance, recreational sporting ability and aspirations, stair climbing the need for walking aids, the ability to dress and perform self-care, and the ability to perform activities that require knee flexion. Some patients may have considerable interference with social interaction, sexual function and sleep deprivation and may experience exhaustion and even depression from their disease (Palmer, 2008).

2.6 Current therapeutic approaches

Total knee replacement is a surgical treatment witch is considered a major surgery. The aim of physiotherapeutic treatment post surgery is to take care of the structural components of the knee and also be aware about the secondary changes a total knee replacement can provoke. Cryotherapy, soft tissue techniques, post-isometric relaxation, re-training to correct faulty movement patter, analgetics and anticoagulants are some of the therapeutic techniques intended to alleviate the secondary manifestations, and decrease swelling, relieve pain, muscle tension and abnormal posture. The two main goals for physiotherapeutic treatment post knee replacement surgery is,

1. decrease pain
2. improve function (Palmer, 2008)

2.6.1 Physiotherapy

Physiotherapeutic treatment after total knee replacement may consist of e.g. thermotherapy, exteroceptive stimulation, training of weak muscles, post-isometric relaxation, soft tissue manipulation and passive and active movements. Strenghtening,

stretching and relaxation exercises in case of weakness and tautness is important for the muscles sorrounding the knee joint to helps improve function and range of motion, witch is important for the daily activity and self-independency. Soft tissue manipulation is extremely important in painful structures of the locomotor system and essential for all manipulative techniques (Lewit, 2009).

2.6.2 Motor splint machine

Motor splint machine is used for passive range of motion, and is a good approach due to the ability to measure the degrees from day to day. After knee replacement surgeries, the motor splint machine is often indicated daily in the postoperative state.

2.6.3 Thermotherapy

The application of cold compression is called cryotherapy and is important during the rehabilitation after total knee replacement. The cold compression is proved to decrase pain, increase range of motion faster and shorten the hospitalization (Kullenberg, 2006). Cold compression therapy constrict the blood vessels and slows down the metabolism of the cells. The reduced metabolism lowers the need of oxygen and nutients. Cold compression therapy also has a numbing effect on the nerve endings decreasing the impulses to the brain perceived as pain (Knight, 1995).

2.6.4 Jointplay

Jointplay mobilization after a total knee replacement is indicated for pain (not severe pain) and/or retrictions. The goal of jointplay is to return disturbed segments to their natural position and restore normal mobility to joints, this generally involves mobilization in all directions, caudal, cranial, dorsal and ventral. We have two types of joint movement, functional movement and jointplay movement, both can be affected by restrictions. The functional movement is performed actively while the jointplay is a movement of a joint passively, this comprises a translatory movement of one joint surface againts the other, sometimes also rotation and distraction of the joint facets. The jointplay therapy also consist of traction, gapping, rotation, all with respect according to the treated joint (Lewit, 2009).

2.6.5 Soft tissue manipulation

The soft tissue manipulation techniques is a important part of the therapy and rehabilitation of a patient. We examin and treat the mechanical function in order to assess elasticity, mobility relatively to other structures, and mutual patterns of displacement. The importance of soft tissue is that the locomotor system as a whole is embedded in soft tissue layers. The technique is carateristically uniform for all soft tissue, weather we want to stretch or shift, we first take up the slack and engage a barrier, and then without much change in pressure or pull release will occure after a brief latency period (Lewit, 2009).

2.6.6 Exteroceptive stimulation

Our skin sensation of touch also has implications for our locomotor system. These implications are so immediate because the sensitivity of our skin is linked to its tension, which in turn is connected with the tension of the subcutaneus connective tissues and of the muscles. Increased skin sensitivity is generally associated with increased tension in all tissues, including the muscles, while redused sensitivity is linked with hypotonus.

2.6.7 Post-isometric relaxation

Post-isometric relaxation is inducated for muscles which are taut, painful and not able to relax. During the post-isometric relaxation it is necessary for the patient to relax the muscle after the isometric phase. During this relaxation phase some patients can find it hard to relax, and the therapist can extend the isometric phase, even up to 20 sec. The basics of post-isometric relaxation is that the affected muscle to be treated should be elongated and the patient gives resistance with minimum force for 5-10 seconds, followed by relaxation of limb which is supported by therapist. This therapeutic procedure is also performed with breathing instructions, inspiration and hold during isometric phase and expiration during relaxation phase (Lewit, 2009).

2.6.8 Strenghtening exercises

Strenghtening exercises for the knee after a total knee replacement involves mainly the muscles attached to the knee joint and we are talking about quadriceps, adductors, triceps surae and hamstrings. The goal for strenghtening exercises is to improve function, stability, posural position and range of motion. During strenght

exercises we also focus on the muscles witch plays an important role in gait, such as musculus gluteus maximus. The strenghtening exercises is performed with isometric, isotonic and eccentric exercises (Brugiono, 2004)

2.6.9 Brugger concept

The Brugger concept uses the Thera-band during exercises, and enables the patient to alternating eccentric and concentric contraction of the given muscle group. The main goal for using Brugger concept after total knee replacement is improvement in coordination, reduction of functional shortening of overused muscles, improvement of kinesthetic sense and dynamic muscle strenghtening. Active resisted movements are used to activate muscle groups that are anatomical antagonists to muscles that are shortened (Liebenson, 2007).

2.6.10 Biolamp

Biolamp is light that is polychromatic without UV part, and the wave lenght is 430-2800 nm, other properties of the biolamp is that it is coherent and polarizated. The physiologic effect is called bio-stimulation, and the penetration is 1-2,5 cm. The indication list is long but e.g. soft tissue regeneration, scar tissue healing, bone healing and myofascial TrP can be treated with this technique.

2.6.11 Sensomotoric exercises

Sensomotoric exercises deals with the upright posture of a body, its aim is to improve function of the postural system and the motor program that controls the posture in vertical position, especially in gait and stanice. Indication for sensomotoric stimulation can be uncoordinated muscles, hypermobility, instability and even poor general fitness. It gives improvement in motor programming and regulation, and it increases the speed of activation of a muscle. When provided, it gives better control of the trunk, improved activations of the gluteal muscles and better stability in the pelvis is achieved. Aids used in the sensomotoric exercises can be balance boards, fitter, minitrampoline, or balance shoes, and some exercises without aids is lunges, half steps backward and forward, corrected stanice on single leg or small foot (Liebenson, 2007).

2.6.12 Pharmacotherapy

The pharmacotherapy treatment after total knee replacement is most commonly antocoagulants, analgetics and anti-inflammatory medication. The goal of pharmacotherapy is to manage and decrease pain, reduce the chances of DVT and inflammation. Antibiotics is medicine witch helps prevent or treat an infection, as you are at higher risk of getting infections after total knee replacement. Nonsteroidal anti-inflammatory medicine may help decrease pain, inflammation and swelling. NSAIDs is also a common name of this medicines, and may also be used to decrease a high body temperature. Carefully use of this medicines is necessary due to the increased cause of stomach bleeding or kidney problems in certain people. Aspirin is often the first choice for prevention of DVT, it is easy to take and does not require monitoring like warfarin or injection like heparins (Kennon, 2008).

2.7 Prognosis

Prognosis for the patient after total knee replacement due to osteoarthritis is quite good commonly. She will most lightly be able to perform any activity that she wants. There are of course some restrictions for athletes, but this patient is quite inactive which probably also gives her a very good knee for several years. Knee replacement has been shown to offer predictable pain relief with improved function in elderly patients or patients who have rheumatoid arthritis and osteoarthritis. Total knee replacement has been shown to be effective in younger patients, but there is concern regarding the possibility of aseptic loosening due to wear debris generated by a younger, active patient over many years. Because of the potential for numerous revision operations in the course of a lifetime, total knee replacement has generally been reserved for patients who are at least sixty years old. However, we are not aware of any study in which the activities of patients after a knee replacement were specifically examined to determine if any are, in fact, associated with increased loosening. Similarly, we know of no study that has documented whether there is increased loosening of total knee replacements over the long term in younger patients who have osteoarthrosis (Diduch, 1997).

As with any other surgeries, there is always risk factors with the procedure, these risks include swelling, infections, bleeding, persistant pain, patellofemoral complications, difference in leg lenght, vascular and circulatory disorders, neurological dysfunctions and DVT to mention some (Palmer, 2008).

3 Special part

3.1 Methodology

My bachelor practice took place at Revmatologický ústav clinic in Prague, Czech Republic, from 03.02.14 until 14.02.14. Revmatologický ústav is a institute of rheumatology and a hospital for training and education. The hospital is a professional medical facility for patients with rheumatic diseases, they provide comprehensive health care for both inpatients and outpatients.

My case study was underdone at the physiotherapeutic department in the hospital, and the department receives patients with all kinds of patients with different rheumatic diseases. The department has an therapy room in the basement with 4 treatment tables, overballs, fitnessballs, Thera.band, redcord and wallbars to mention some.

My study was supervised by Mrg. Maja Špiritović, which is preparing for her PhD. This year in the field of rehabilitation in rheumatology for systemic scleroderma and polimyositis. All examinations and therapeutical approaches were done in cooperation with her.

My patient was imformed from the beginning that my work has been approved by the Ethics Committee of the Faculty of Physical Education and Sport at Charles University in Prague with the approval number 083/2014

3.2. Anamnesis

Performed 05.02.14

Examined person: J.P., Female

Year of birth: 1974

Present state

Height: 174

Weight: 95

BMI: 31,4

Status presens: TEP of dx. knee 27.01.14.

Diagnosis:

M058 Rheumatoid arthritis

M171 Osteoarthritis of knee

Chief complaint:

Pain and decreased range of motion in dx. lower extremity after TEP of knee.

History of present problem:

In february 2009 she had morning stiffness 2-3 hours. Rheumatologist tested her in august 2009 - diagnosed with rheumatoid arthritis, initiation of treatment with corticosteroids and Methotrexate.

December 2012 – RTG indicated knee osteoarthritis 2nd degree, which indicated TEP dex knee joint.

Medical history:

Diseases:

rheumatoid arthritis, osteoarthritis.

Operations: :

2003: Splenectomy after a car accident,

2005: Osteosynthesis bilateral Malleolus sin.

Artificial lens operation dx. eye after an injury

Autotransplantation, necrectomy from anterior tighs to soles after scald of soles

Injuries:

Colles fracture sin.

Finger fracture (unknown which one)

Scars on the sin. knee and in face after maltreatment at home.

Pharmacological anamnesis:

Salazopyrin en. - por tab ent 100x500 mg.	2 x morning/2 x evening
Medrol 4 mg. - por tab nob 30x4mg.	1 x morning
Perindopril 8 mg VULM - por. tab. 30x8mg.	1 x morning
Apo-Ome 20 – por. Cps. Etd. 28x20 mg.	1 x morning
Ciprinol 500 – por tab. Flm. 10x500mg.	1 x morning/1 x evening
Zaldiar port ab flm 20.	1 x morning/1 x afternoon/1 x evening
Magnesii lactici 0,5 tab. por tab nob 100x0,5mg	

Gynecological anamnesis:

Regularly examinations, no pathology, no children.

Allergies:

PNC - cutaneous allergic reactions in childhood

Family history:

Mother had arterial hypertension and died 68 years old after stroke.

Father died 55 years old of pancreatic cancer.

Siblings: 1 sister which is healthy

Social history:

Widow since 2008.

Occupation:

Earlier cashier, used to sit 10 hours per day. Now unemployed.

Hobbies:

Reading books and knitting.

Living condition:

Patient lives in a familyhouse with her boyfriend. The house has 1 floor with 7 steps.

Abuses:

Occationally alcohol and cigarettes (approx. 60/month)

Previous rehabilitation:

6 months ago she was in the Revmatology clinic for exercising pre-TEP op.

Statement from the patient's medical documentation:

N/A

Indication of rehabilitation:

Patient is indicated for therapy and rehabilitation after TEP of dex. knee.

Strengthening exercises for the lower extremities.

Soft-tissue techniques

Mobilization of distal joints from the right knee and patella.

Walking and verticalization

Motor-machine 60 min. a day

Ergotherapy of hands. (with ergotherapeut)

Biolamp on hematoma

Differential balance:

Muscle weakness/asymmetry in muscletone.

Antropometric asymmetry in lower extremities.

Increased ROM in operated knee.

Blockage of joints, distal to TEP and patella.

Typertone of adductors of thigh, quadriceps, triceps surrae, hamstrings, iliopsoas.

Change of posture can lead to other issues.

Soft tissue restrictions in skin, subskin, fascia and muscles of lower extremity.

Structural changes due to scar tissue

3.3 Initial kinesiologic examination

Examination were performed 05.02.2014

3.3.1 Posture examination

(without plumbline/with cruthes)

The dorsal aspect:

	sin.	dx.
Roundness of heels:	Flat with eversion	Not visible due to bandage
Position of heels:	Narrow base	
Shape of achilles tendon:	Valgosity	Not visible due to bandage
Thickness of achilles tendon:	Not visible	Not visible due to bandage
Shape of calfs:	Round	Not visible due to bandage
Position of knees:	Marked valgus	Moderate valgus
Shape of thighs:	Symmetrical round	
Height of gluteal folds:	Decreased fold	Decreased fold
Tone of gluteal muscles:	Hypothrophic	Hypothrophic
Waist:	Wide and symmetrical	
Lumbar spine	Curvature to the sin.	
Thoracic spine	Curvature to the dx.	
Cervical spine:	Midline	
Scapluaes	Not visible	Not visible
Shoulders:	Slightly elevated	Moderate elevated
Neck:	Short and C7/Th1 is very prominent	
Head:	Shifted to dx.	

Table 3 The dorsal aspect of the postural examination

The lateral aspect:

	sin.	dx.
Shape of malleolus:	Pathological due to surgery, slightly visible	Not visible due to bandage
Shape of calfs:	Round	Not visible due to bandage
Shape of knees:	Physiological	Semiflexion
Shape of thighs:	Round	Round

Shape of buttock.	Flat	Flat
Abdomen	Slightly protracted	Moderate protracted
Lumbar curvature:	Hyperlordosis	
Thoracic kyphosis:	Hyperkyphosis	
Position of shoulders:	Protracted	
Cervical curvature:	Hyperlordosis	
Head	Protracted	

Table 4 The lateral aspect of the postural examination

The ventral aspect:

	sin.	dx.
Position of feets:	Narrow base	
Toes:	Abnormality of 4th toe	Abnormality of 4th toe
Longitudinal arch:	Flat	Flat
Transverse arch:	Flat	Flat
Position of ankles:	Moderate inversion	Moderate inversion
Knees:	Marked valgosity + a big scar on patella	Marked valgosity
Thighs:	Symmetrical	Symmetrical, but hematoma medially
The upper abdomen:	Prominent with a big scar at the level of 8th rib approx.	Prominent
The lower abdomen:	Prominent	Prominent (more than sin.)
Umbilicus:	Slightly shifted to dx.	
Sternum:	Midline	
Clavicles:	Symmetrical	
Supraclavicular fossa:	Sin. is deeper than dx.	
Shoulders:	Slightly elevated	Moderate elevated
Symmetry of face:	Sin. side is dropped more than dx.	
Face	Mild cushing face	
Hair:	Loss especially on sin. frontal lobe	

Table 5 The ventral aspect of the postural examination

3.3.2 Pelvis examination

ASIS	Right is higher	Without pain
PSIS	Right is higher	With pain, bilaterally
Crista	Right is higher	Without pain

Table 6 Pelvic examination results

3.3.3 Gait examination

Performed with crutches

Forward walking:

	sin.	dx.
Feets:	Inversion of plantae.	Inversion of plantae, decreased extension of ankle in heel strike is present.
	Step length is bigger on sin. side and increased time is spent in the stanice phase on sin. foot. No rolling movement on feets during gait. Speed is not constant	
Knees:	Moderate valgosity	Moderate valgosity
Hips:	Marked decreased extension	Marked decreased extension with moderate external rotation. Patient makes circumduction during gait.
Lumbar area:	Limited movement	
Paravertebral muscles	Limited movement	
Upper trunk rotation	Rotates during gait	
Lower trunk rotation	Stiff due to crutches	

Table 7 Gait examination results

3.3.4 Palpation

Lower Extremity:

	sin.	dx.
Skin:	No HAZ, temp. differences,	Pathological barriere and

	skin color differences nor restrictions	increased temp. lateral and cranial to knee joint. Swollen in whole lower extremity and a big hematome anteriomedially on thigh. Skin is dry. Sterile bandage on scar and painfull in the hematoma area on thigh.
Subcutaneus tissue and fascia:	No restrictions nor pain	Folding the skin arond the longitudinal axis shows barriere in both directions on both calf and thigh.
Muscles:	TrP in adductors of thigh, hamstrings and piriformis. No periosteal pain points, nor restrictions	Pain superior border of patella, lateral acpect of distal thigh and proximal calf. Periosteal pain point on fibular head. Trp in piriformis, triceps surrae, biceps femoris, iliopsoas and adductors of thigh. Hypotrophic and hypertone muscles in thigh and calf.

Table 8 Palpation results

3.3.5 Examination of muscle lenght according to Janda

Muscle tested:	Grade:	
	sin.	dx.
Soleus:	0	1
Gastrocnemius:	0	0
Hamstrings:	0	1
Adductors of thigh:	0	2

Iliopsoas:	0	2
Tensor facia lata:	0	2
Rectus femoris:	0	2

Table 9 Muscle length results for lower extremities

3.3.6 Examination of joint play according to Lewit

Joint:		Restrictions/blockages	
		sin.	dx.
DIP	2nd	No blockage	No blockage
	3rd	No blockage	No blockage
	4th	No blockage	No blockage
	5th	No blockage	No blockage
PIP	1st	Ventral blockage	No blockage
	2nd	No blockage	No blockage
	3rd	No blockage	No blockage
	4th	No blockage	No blockage
	5th	No blockage	No blockage
MTP	1st	No blockage	No blockage
	2nd	No blockage	No blockage
	3rd	No blockage	No blockage
	4th	No blockage	No blockage
	5th	No blockage	No blockage
Lisfranc´s		No blockage	No blockage
Chopart´s		No blockage	No blockage
Subtalar		No blockage	No blockage
Talocrural		No blockage	No blockage
Tibiofibular		No blockage	No blockage
Patella		caudal/cranial	caudal/cranial/latero/medial

Table 10 Joint play examination results

3.3.7 Examination of antropometric measurements

Measured:	Centimeter	
	Sin.	Dx.
Malleolus:	30	28
Metatarsal heads:	24	24,5
Calf:	41	42
Tibial tuberosity:	40	47
Knee joint:	44	50
Above knee:	45	53
Vastus medialis:	48	55
Quadriceps:	57	63
Functional Lenght:	97	97
Anatomical lenght:	86	85,5
Crests:	97	97
Femur:	42	42
Calfs:	44	44

Table 11 Antropometric measurements results

3.3.8 Examination of muscle strength according to Kendall

Muscle	Muscle Group	Position	Grade	
			sin.	dx.
Deltoid	Shoulder abductors	Sitting	5	5
Biceps brachii	Elbow flexors	Sitting	5	5
Wrist extensors	Extensor carpi ulnaris/radialis	Sitting	5	5
Wrist flexors	Flexor carpi ulnaris/radials	Sitting	5	5
Iliopsoas	Hip flexors	Sitting	4	4
Quadriceps	Knee extensors	Sitting		

femoris			5	3
Tibialis anterior	Ankle dorsiflexors	Sitting	4	3

Table 12 Muscle strength test results

3.3.9 Examination of range of motion

Degrees measured with goniometr

Joint measured	Active movement	Passive movement
Dx. MTP joints (all 5 joints)		
Flexion	40	50
Extension	50	70
Sin. MTP joints (all 5 joints)		
Flexion	40	50
Extension	40	60
Dx. Inversion of foot	30	40
Sin. Inversion of foot	35	45
Dx. Eversion of foot	15	20
Sin. Eversion of foot	20	25
Dx. talocrural plantar flexion	45	50
Sin. talocrural plantar flexion	45	50
Dx. talocrural dorsal flexion	15	25
Sin. talocrural dorsal flexion	15	25
Dx. knee extension	-20	
Sin. knee extension	0	0
Dx. knee flexion	80	85
Sin. knee flexion	125	130
Dx. hip external rotation	45	50

Sin. hip external rotation	50	55
Dx. hip internal rotation	20	30
Sin. hip internal rotation	35	40
Dx. adduction of hip	10	15
Sin. adduction of hip	20	25
Dx. abduction of hip	25	30
Sin. abduction of hip	35	40
Dx. flexion of hip	100	115
Sin. flexion of hip	125	130

Table 13 Range of motion results

3.3.10 Neurological examination

Dermatome sensation in lower extremities:

Dermatome	Sensation	
	sin.	dx.
L2	Physiological	Physiological
L3	Physiological	Physiological
L4	Physiological	Physiological
L5	Physiological	Physiological
S1	Physiological	Physiological
S2	Physiological	Physiological

Table 14 Neurological examination results

3.3.11 Examination of deep tendon reflexes

Tendon tested:	Tendon reflex	
	sin.	dx.
Patellar (L2-4)	Physiological	- sutures and sterile bandage
Achilles (L5-S2)	Physiological	Physiological
Medioplantar (L5-S2)	Physiological	Physiological
Biceps tendon (C5)	Physiological	Physiological

Table 15 Deep tendon reflexes result for lower extremities

Conclution of examination

Posture examination

The posture examination in standing position indicate that patient is strongly influenced by an analgetic posture, supporting herself quite alot on the crutches witch indicate that she wants to decrease the pain in her lower extremity and this is non-physiological and can cause secondary changes of the musculoskeletal system over time. This faulty allingment results in exessive stress on bones, joints, ligaments and muscles. Her marked valgosity in knees indicate short/taut adductor muscles of thigh and elongated/weak antagonists. Her posture is kyphotic/lordotic witch can indicate anteriorly tilted pelvis, elongated neck flexors, upper back erector spinae, external oblique and hamstrings, and the neck extensors and hip flexors shortened.

Pelvis examination

The pelvic examination shows that the right PSIS, ASIS and crista is higher than on the left side, this indicate pelvic obliquity. Measurement of leg lenght is more difficult than might be thought, because the head and neck of the femur are not externally evident. Pelvic obliquity is therefor the most reliable clinical sign of difference in leg length, unless there is a measurable difference in the leg of the lower extremity. Typically for this pelvic obliquity is that the shoulder is seen to be lower on the side where the pelvic is higher, but in this case the shoulder is actually higher. The most likely cause to this findings is that the patient has a analgetic posture and the right side of pelvis could be elevated due to the pain in right knee. The elevated shoulder could also be caused by the analgetic posture and crutches.

Gait examination

The gait shows eversion of plantae during steps, similar to the standing posture examination. Circumduction of right foot with slight external rotation, mostly due to painful knee and problems with flexion in knee and dorsiflexion of ankle joint. Also the step length for right foot is short with limited time spent in the stanice phase, which causes slight limping. The marked valgosity in knees is present and her limited extension in hip is quite big which secondary causes limited trunk movements.

Palpation examination

Palpation of the soft tissue on rigth lower extremities indicates restrictions and

dysfunction. In the skin it is present swelling, fewer, and bruising. Subskin and facia has restrictions in all directions and hypertoned muscles in calf and distal tigh. Making a fold along longitudinal axis is hard to perform, and not very plesant for the patient. TrP are found in the piriformis, triceps surae, biceps femoris, iliopsoas and adductors of thigh. Clinical significance for TrP in biceps femoris muscle is painful periosteal pain point in head of fibula which is also present. In the left lower extremity TrP are present in adductors of thigh, piriformis and hamstrings.

Muscle lenght examination

The examination of muscle length in right lower extremity indicates that the findings in the posture examination was correct, as mentioned, the kyphotic/lordotis posture leads to shortened hip flexors, and in the muscle length examination iliopsoas, tensor fasciae latae and rectus femoris tends to be marked shortened. The thigh is raised above the horizontal plane during examination. Also her marked valgosity in knees indicated short muscles medially on thigh, and this is confermed with the length test on adductors of thigh resulting in marked shortness. The typical elongated hamstrings in kyphotic/lordotic posture is not present in this case, patients hamstrings is short with the mark moderate. Left lower extremity has no shortness.

Jointplay examination

In right lower extremity pathological blockages is present in patella, the diretions with restrictions is both caudocranial and lateromedial. And the same is present in the left lower extremity with the 1st. PIP joint blocked in ventral direction and the patellae is blocked in craniocaudal direction. Both stress and the neuromuscular system plays a role here. One pathogenoc factor is overload, another, more frequent cause is a disturbed movement pattern (motor stereotype) on the part of the patient, consisting of an imbalance of muscle function which impaires the joints.

Antropometric measurements examination

The measurements shows us the difference between left and right lower extremities in both circumference and length. The measurements indicate that the right knee is quite swollen. Difference from left knee is a bigger circumference up to 8 cm on the right knee. But another significant finding is that the circumference of malleolus on right leg is actually 2 cm smaller, this is propably a result caused by the osteosynthesis

of left malleolus in 2005. The hematoma should be followed up, due to the big difference in antropometric measurements in case of internal hemorrage, even the chances for this after a total knee replacement is small.

Muscle strength examination

Test for the upper extremity compared with the lower extremity indicates slight weakness in lower extremities, probably due to the surgery and limited activity in her ADL. The muscle strength is performed in sitting position due to the patients problems with lying position. The tests for knee flexors and hip extensors is excluded due to the scar and pain for patient in prone position. The hip flexors and dorsiflexor of ankle left side is graded 4 in anti-gravity sitting position, which is against moderate pressure. Right knee extensors and dorsiflexor of ankle is graded 3, which is also anti-gravity tested in sitting position. Grade 3 shows that the patient is able to hold the position, with no pressure added. The weakness present in hip flexors can result in marked disability to climb stairs and also difficult in walking, because the leg must be brought forward by pelvic motion which is produced by anterior or lateral abdominal muscle action rather then by hip flexion. The quadriceps femoris weakness also influence on the ability to climb stairs and getting up and down from sitting position. The weakness might also cause hyperextension of knee joint due to required locking of the joint when the quadriceps is weak. Tibialis anterior weakness decreases the ability to dorsiflex the ankle, and allows a tendency that we have already noticed during postural examination and gait examination, the eversion of the foot.

Range of motion examination

The range of motion examination excludes the range of motion in extension of hip joint due to patients pain in prone position and the active range of motion in knee extension due to pain and fear shown by the patient. The examination results for right lower extremity indicate decreased range of motion compared to left side. In patients left ankle joint, the decreased range of motion is most lightly caused by her osteosynthesis of malleolus. On the right side we can see that the patient has decreased motion in every joints. The reason for the limited active range of motion is of course pain, but also influenced by weakness. While the passive range of motion is affected by the change in joint space and joint structure. Her flexion of left knee could probably increase if she was able to be in prone position, but this was tested in sitting position,

where the treatment table had influence on the measurement result.

Neurological examination

Results is physiological in all dermatomes tested.

Deep tendon reflexes examination

Results is physiological in all deep tendons tested, with the exception of patellar tendon L2-L4 right side due to the sutures and sterile bandages.

3.4 Rehabilitation plan

3.4.1 Short term rehabilitation plan

The short rehabilitation plan will focus on the active range of motion and the improvement during the hospitalization. The active range of motion in extension and flexion should reach 0-110 degrees within a few weeks (1-6 weeks). Muscle strenghtening of the entire operative extremity with emphasis on the knee extensor and flexor muscle groups. Attention should also be direct toward the weakness present in iliopsoas, quadriceps and tibialis anterior in dx. operative extremity, as well as the generalized weakness in iliopsoas and tibialis anterior in contralateral lower extremity. Muscle tension and shortness in soleus, hamstrings, adductors of thigh, iliopsoas, tensor facia lata and rectus femoris need stretching and relaxation treatment, and the blocked joints in PIP-joint and patellae should be mobilized regularly as indicated. Endurance exercises and gait to increase the cardiovascular fitness, stability and balance, with the respect to her needs of crutches. Decrease inflammation, pain and swelling and improve ADL function.

3.4.2 Long term rehabilitation plan

The long term plan is that the patient can return to appropriate recreational sports and activities, enhance strenght, endurance and proprioception as needed for ADL. The terapeutic exercises will continue with the previous exercises with progression of resistance and repetitions and also the duration of endurance activities.

3.5 Therapy progress

Day to day Therapy – Day 1

Date: 05.02.14 **Time:** 13.00 PM.

Patients status before therapy:

Patient is fatigue and pale. She seems weak and tired, but is smiling. She tells us that she slept bad due to the pain in the knee. Skincolor and temperature in her dex. lower extremity is fine. My advisor in the clinic tells me that she is motivated for examination, exercises and therapy, but her body language seems like the opposite to me.

Goals of todays therapy:

- DVT prevention
- Increase ROM
- Decrease edema
- Jointplay
- Verticalization
- Find suitable self therapy

Therapy proposal:

- Active movement in talocrural joint to increase the circulation system for prevention of deep vein thrombosis.
- Soft tissue techniques for reduction of edema and release any restrictions in skin, subskin, fascia or muscles in right lower extremity.
- Isometric strenghtening exercises with overball to strenghten vastus medialis, vastus intermedius, vastus lateralis, rectus femoris and gluteal muscles.
- Gait exercises with crutches in stairs.
- Mobilization technique of blocked joints.

Therapy implementation:

- DVT prevention
    - Dorsiflexion of talocrural joint
    - Plantarflexion of talocrural joint
    - Circumduction in both directions of talocrural joint.
- Soft tissue techniques
    - Soft ball
    - Skinfold around longitudinal axis and fold for stretching of connective

tissue
    - Stroking
- Jointplay
    - Sin. PIP mobilization in ventral direction
    - Dx. patella in all directions
    - Sin. patella in cranial/caudal direction.
- Isometric contraction (15 repetitions)
    - Overball under knee for quadriceps, supine position and pressing knee down towards the table.

Result:

Subjective:

The exercises produced some pain and stiffness in the beginning around the knee joint. After some repetitions it was better and easier to perform the differet movements, but the pain in and around the knee joint maintained. She is comfortable with the given exercises and gait exercise in stairs. Patient finds verticalization quite easy.

Objective:

The patient had slightly increasing ROM in ankle joint after some repetitions of DVT prevention. She needs to practicing the correct performance of each exercise with guidance from therapist. She has slightly edema in her right foot. Her gait was in the beginning with slightly external rotation in right hip, but after correction and telling her this, she was able to have a correct gait. Her cruthes was not symmetrical or corrected to her height in the beginning, so I corrected it immediately and this resulted in better gait and easier to perform gait in stairs. Her verticalization technique is perfect, so I will not focus on this.

Self therapy:

- DVT prevention 5 min. every hour
- Pillow under knee in bed for isometric contraction of quadriceps 10-12 repetitions, 3 times a day.
- Bring the heel towards the buttocks by sliding it on the matress for isotonic contraction of tibialis anterior and hamstrings 10-12 repetitions, 3 times a day.

Day to day Therapy – Day 2

Date: 06.02.14 **Time:** 13.00 PM.

Patients status before therapy:

The patient is pale, but she seems better than the day before. She is more awake and ready for exercises and therapy. Skincolor and temperature in her dex. lower extremity is fine. Patient feels comfortable with the exercise I gave her yesterday, so this maintain the same for now.

Goals of todays therapy:

- DVT prevention
- Increase ROM
- Strenghtening exercises
- Stretching and relaxation of thigh. Adductors and quadriceps muscle.
- Decrease edema
- Dercrease restrictions in fascia, subskin and skin

Therapy proposal:

- Gait exercises for stability and strenght.
- Active movement in talocrural joint to increase the circulatory system for prevention of deep vein thrombosis.
- Soft tissue techniques for reduction of edema and release any restrictions in skin, subskin, fascia or muscles in right lower extremity.
- Mobilization of patellae and sin. 1st. PIP joint in case of blockages.
- Isometric exercises with overball in supine position to strenghten vastus medialis, vastus intermedius, vastus lateralis, rectus femoris, adductor magnus, adductor brevis, adductor longus, pectineus and gracilis.
- Isotonic exercises with overball in supine position to strenghten the hamstrings.
- PIR for relaxation of the hypertoned muscles.

Therapy implementation:

- Gait exercise
    - In stairs with crutches
- DVT prevention
    - Dorsiflexion of talocrural joint.
    - Plantarflexion of talocrural joint.
    - Circumduction in boyh directions of talocrural joint.

- Soft tissue techniques
    - Softball
    - Stroking
    - Skinfolds along longitudinal axis and fold for stretching of connective tissue.
- Jointplay
    - Sin. PIP mobilization in ventral direction
    - Dx. patella in all directions
    - Sin. patella in cranial/caudal direction.
- Isometric contraction (20 repetitions)
    - Overball under knee to press down for quadriceps
    - Overball between knees with 90 degrees flexion for adductors.
- Isotonic contraction (20 repetitions)
    - Overball under ankle and sliding heel towards the bottock for hamstrings.
- PIR in supine and side lying position (5 repetitions)
    - Adductors of thigh
    - Vastus intermedius, vastus medialis, vastus lateralis and rectus femoris.
    - Piriformis
    - Hamstrings

Result:

Subjective:

The patient does not appreciate the PIR technique. She feels pain in thigh adductors and hip flexors. She liked the jointplay examination and therapy.

Objective:

The patient is not able to relax the adductors of thigh during PIR. She gets cramps in the calf every 60 seconds and its necessary for her to sit up for a minute or two. The muscles are very tense and taut. The cramps is also present during soft tissue technique with the softball strokes on the adductors. She is otherwise strong in the muscles and the strenghtening exercises is successful. The blockages in joints was again present.

Self therapy:

- DVT prevention 5 min. every hour

- Pillow under knee in bed for isometric contraction of quadriceps 10-12 repetitions, 3 times a day.
- Bring the heel towards the buttocks by sliding it on the matress for isotonic contraction of tibialis anterior and hamstrings 10-12 repetitions, 3 times a day.

Day to day Therapy – Day 3

Date: 07.02.14 **Time:** 13.00 PM.

Patients status before therapy:

The patient has good skin color in her face and is walking quite fast in the stairs with good coordination and balance. She feels more secure. The patient can tell that she completed the self therapy without any problems, but she feels some pain during night when she is performing alot of strenghtening exercises. The pain is located distal and medially to the patella. I can see that she is still swollen in her knee, and today she is quite warm lateral and medial to the scar on the knee.

Goals of todays therapy:

- DVT prevention
- Increase ROM
- Strenghtening exercises for leg.
- Stretching and relaxation of thigh. Adductors and quadriceps muscle.
- Decrease edema
- Dercrease restrictions in fascia and skin
- Mobilization of restricted joints

Therapy proposal:

- Gait exercises with crutches in stairs for stability and strenght.
- Active movement in talocrural joint to increase the circulatory system for prevention of deep vein thrombosis.
- Soft tissue techniques with softball for reduction of edema and soft tissue manipulation for release of any restrictions in skin, subskin, fascia or muscles.
- Mobilization technique of patellae and sin. 1st. PIP joint in case of blockages.
- Isometric exercises with overball in supine position to strenghten vastus medialis, vastus intermedius, vastus lateralis, rectus femoris, adductor magnus, adductor brevis, adductor longus, pectineus and gracilis.
- Isotonic exercises with overball in supine position to strenghten the hamstrings.
- PIR for relaxation of the hypertoned muscles.

Therapy implementation:

- Gait exercise
    - exercise in stairs with crutches
- Soft tissue techniques

    - Softball
    - Stroking
    - Skinfolds along longitudinal axis, fold for stretching the connective tissue
- DVT prevention performed with patient supine
    - Dorsiflexion of talocrural joint.
    - Plantarflexion of talocrural joint.
    - Circumduction in both directions of talocrural joint.
- Jointplay mobilization
    - Sin. PIP mobilization in ventral direction
    - Dx. patella in all directions
    - Sin. patella in cranial/caudal direction.
- Isometric contraction
    - Flexed knees with fitnessball under calfs for hamstrings. 20x2 repetitions.
    - Overball under knee for quadriceps, 15 repetitions.
    - Flexed knees with overball between for adductors, 15 repetitions.
- Isotonic contraction
    - Overball under ankle and sliding heel towards the bottock for hamstrings. Repeated 20 times.
- PIR in supine and side lying position (5 repetitions)
    - Adductors of thigh
    - Quadriceps
    - Hamstrings
    - Piriformis
    - Iliopsoas

Result:

Subjective:

During the therapy J.P. still has some problems with relaxing during the PIR. She feels alot of tension in her adductors of the thigh. Strenghtening exercises is without any problems for her, and she feels stronger then earlier.

Objective:

J.P is persistent today and in good shape. During the gait exercises in the stairs

she needed to be reminded about the correct step-pattern with crutches in the stairs, but after it was correct. She is able to do the exercises without any pain, and she feels slight fatigue after exercising.

Self therapy:

- DVT prevention 5 min. every hour
- Pillow under knee in bed for isometric contraction of quadriceps 10-12 repetitions, 3 times a day.
- Bring the heel towards the buttocks by sliding it on the matress for isotonic contraction of tibialis anterior and hamstrings 10-12 repetitions, 3 times a day.

Day to day Therapy – Day 4

Date: 10.02.14 **Time:** 13.00 PM.

Patients status before therapy:

She forgot her appointment at 11:00 AM today, so we moved the time to 13:00 PM. J.P. seems happy and I find her sitting with some friends laughing around the table. She is without any pain today and is motivated and ready for therapy and exercise.

Goals of todays therapy:

- DVT prevention
- Increase ROM
- Strenghtening exercises
- Decrease edema
- Dercrease restrictions in fascia and skin
- Jointplay

Therapy proposal:

- Gait exercises with crutches in stairs for stability and strenght.
- Active movement in talocrural joint to increase the circulatory system for prevention of deep vein thrombosis.
- Soft tissue techniques with softball for reduction of edema and soft tissue manipulation for release of any restrictions in skin, subskin, fascia or muscles.
- Mobilization technique of patellae and sin. 1st. PIP joint in case of blockages.
- Isometric exercises with overball in supine position to strenghten vastus medialis, vastus intermedius, vastus lateralis, rectus femoris, adductor magnus, adductor brevis, adductor longus, pectineus and gracilis.
- Isotonic exercises with overball in supine position to strenghten the hamstrings and with Thera-band to inhibit the thigh adductors and improve function of internal rotators of hip.
- PIR for relaxation of the hypertoned muscles.

Therapy implementation:

- Gait exercise
    - in stairs with crutches
- Soft tissue techniques
    - Softball
    - Stroking

    - Skinfold around longitudinal axis and folds for stretching of connective tissue.
- DVT prevention
    - Plantar flexion of talocrural joint.
    - Dorsal flexion of talocrural joint.
    - Circumduction in both directions of talocrural joint.
- PIR (3 repetitions)
    - Adductors of thigh
    - Quadriceps
    - Iliopsoas
    - Piriformis
    - Hamstrings
- Jointplay mobilization
    - Sin. PIP mobilization in ventral direction
    - Dx. patella in all directions
    - Sin. patella in cranial/caudal direction.
- Isometric contraction
    - Overball under knee and pressing down for quadriceps. Repeated 2x20 times.
    - Overball under ankle and sliding heel towards the bottock for hamstrings. Repeated 20 times.
    - Overball between flexed knees, elevation of pelvis and hold for 3 seconds, for hamstrings, gluteals, lower back, abdomen and pelvic floor. 10 repetitions.
    - Straight leg raise for quadriceps, 15 repetitions.
- Eccentric contraction according to Brügger concept
    - Thera-band crossing around knees, 2x10 repetitions.

Result:

Subjective:

J.P. liked the new exercise with thera-band for elongation of the internal hip rotators. She find it hard to perform the straight leg raise due to weakness, but would like to continue to perform it during the therapy the next days.

Objective:

J.P. dont have any blocking in her joints today, and during the exercises she appears stronger. Her motivation is highter than last week, and i suppose that it has to do with well-being and a sense of mastering the exercises better each day we are together. Her bruising on the medial thigh is significantly decreased at this time. When I touch her medially dx. thigh, she still gets cramps and has to sit up for a minute, so the thera-band exercise should be good for elongation and inhibition of the adductors so that relaxation could be possible.

Self therapy:

- DVT prevention 5 minutes every hour.
- Passive knee stretch by relaxation the muscles on the thigh to push the knee straight while she holds a towel around the plantae. Pul to raise the heel of the bed just slightly, the knee should always be in contact with the bed. Patient will hold for 10 seconds and repeat 3 times, 3 times a day.
- Straight leg raise, 10 repetitions 3 times a day.
- Isometric contraction with pillow under knee and pressing it down towards the matress for quadriceps strenghtening 10-12 repetitions, 3 times a day.

Day to day Therapy – Day 5

Date: 11.02.14 **Time:** 13.00 PM.

Patients status before therapy:

J.P tells that she has been sleeping bad during the night, she has pain in her right knee after yesterdays exercises. After a look at her foot I can easily see that her edema has increased during the night. Her skin is warm 10 cm. distal and proximal to the kneejoint. She needs help to undress trousers and socks today.

Goals of todays therapy:

- Reduce swelling
- Decrease pain
- DVT prevention
- Active movement of knee joint
- Decrease hypertension in muscles
- Jointplay

Therapy proposal:

- Active movement in talocrural joint to increase the circulatory system for prevention of deep vein thrombosis.
- Soft tissue techniques for reduction of edema and release any restrictions in skin, subskin, fascia or muscles in right lower extremity.
- Active movement with overball in supine position.
- PIR for relaxation of the hypertensed muscles.

Therapy implementation:

- Gait exercises
    - With crutches down stairs
- Soft tissue techniques
    - Softball
    - Stroking
    - Skinfold around longitudinal axis and folds for stretching of connective tissue
- DVT prevention
    - Plantar flexion of talocrural joint.
    - Dorsal flexion of talocrural joint.
    - Circumduction in both directions of talocrural joint.

- Jointplay
    - DIP
    - PIP
    - MTP
    - Lisfranc´s
    - Chopart´s
    - Subtalar
    - Talocrural
    - Tibiofibular
    - Patella
- PIR (3 repetitions)
    - Adductors of thigh
    - Quadriceps
    - Iliopsoas
- Isotonic contraction
    - Overball under ankle, active movement performed by sliding the heel towards the buttock, 2x10 repetitions.

Result:

Subjective:

The patient feels alot of pain, and she just want to finnish as soon as possible. She is comfortable with the passive therapy today and is prepared to go back to her room to have the ice on her knee. The isotonic exercise was a little harder to perform, but she says its ok.

Objective:

Due to the patients pain, temperature increasement and swelling I dont want to provoke more pain with alot of exercises today. She is worried and afraid it will be worse. The jointplay mobilization was performed without pain nor restrictions, except that the tibiofibular joint was slightly painful and the right patella has decreased ROM in the mobilization. PIR on the thigh was harder to perform today, because the patient is not able to relax, and she is afraid that it will hurt. During the therapy implementations, she needs alot of breaks due to her unwell being. PIR of adductors still provokes spasms and she needs alot of breaks.

Antropometric measurements:

Measured:	**Centimeter** **Dex. foot**		
Dates:	11.02.14	05.02.14	
			Deviation
Metatarsal heads	25	24,5	**0,5**
Malleolus	29	28	**1**
Calf	42	42	**0**
Tibial tuberosity	48	47	**1**
Knee	51	50	**1**
Vastus medialis	57	55	**2**
Quadriceps	64	63	**1**

Table 16 Antropometric measurements day 5, with deviation

The antropometric measurements shows us that the swelling has increased quite alot since the last measurement, which was the initial kinesiologic examination.

Self therapy:

- Elevation of leg when she is in bed.
- Rest as much as possible.
- DVT prevention, 5 minutes every hour.

Day to day Therapy – Day 6

Date: 12.02.14 **Time:** 10.30 PM.

Patients status before therapy:

The patient is quiet today and shows decreased body language about her feeligs. She undresses, but need some help with the right foot around ankles and with the sock. She starts to remove the compressing bandage on her own initiative, I let her do it without any help to make her feel mastering and for the range of motion during the movement. Her swelling is decreased since yesterday, she slept good, and is without pain today.

Goals of todays therapy:

- DVT prevention
- Soft tissue techniques
- Increase ROM
- Strenghtening exercises
- Decrease edema
- Dercrease restrictions in fascia and skin
- Decrease hypertension in muscles
- Jointplay

Therapy proposal:

- Gait exercises for stability and strenght.
- Active movement in talocrural joint to increase the circulatory system for prevention of deep vein thrombosis.
- Soft tissue techniques for reduction of edema and release any restrictions in skin, subskin, fascia or muscles in right lower extremity.
- Mobilization technique for patella in supine position.
- Isometric exercises with overball in supine position to strenghten vastus medialis, vastus intermedius, vastus lateralis, rectus femoris, adductor magnus, adductor brevis, adductor longus, pectineus, gracilis, gluteal muscles and hamstrings.
- Isotonic exercises to strenghten the hamstrings, lower abdominals, lower back, hamstrings, gluteal muscles and pelvic floor muscles.
- Eccentric exercise in supine position with Thera-band around knees to improve function of the internal rotators of hips.

- PIR for relaxation of the hypertoned muscles.

Therapy implementation:

- Gait exercises
    - With crutches in stairs
- DVT prevention
    - Plantar flexion of talocrural joint.
    - Dorsal flexion of talocrural joint.
    - Circumduction in both directions of talocrural joint.
- Soft tissue techniques
    - Softball
    - Stroking
    - Skinfold around longitudinal axis and folds for stretching of connective tissue.
- Jointplay
    - Patella
    - PIR
    - Adductors of thigh
    - Quadriceps
    - Iliopsoas
- Isometric contraction
    - Supine position with a fitnessball under calfs with flexed knees for pressing down., 2x15 repetitions.
    - Overball under knee in supine position, pressing the overball towards the table, 2x20 repetotions.
    - Overball under ankle in supine position and pressing down towards table, 2x20 repetitions.
    - Overball between knees which is in flexion, pressing in adduction. 2x12 repetitions.
- Isotonic contraction
    - Fitnessball under calfs with flexed knees, elevation of pelvis. 2x20 repetitions.
    - Overball between flexed knees, alternating elevates right and left foot so that calfs is in same line that thighs.

- Eccentric contraction according to Brügger concept
    - Thera-band crossing around knees, 2x10 repetitions.
- PIR in supine position (5 rep.)
    - Adductors of thigh
    - Hamstrings
    - Iliopsoas
    - Piriformis
    - Quadriceps femoris

Result:

Subjective:

Strenghtening exercises was performed without J.P feeling any pain. She is more comfortable and able to relax during PIR. She feels stronger and more confident in the therapy and exercises.

Objective:

Today J.P had some restrictions in the fascia anterior and lateral to the ankle joint, and after some therapy is was improved. The PIR of the thigh muscles was performed better today, she was able to holding against in the isometric phase and relax for 10 seconds after each performance. Due to this we can see a big improvement in the ability to relax especially the adductors of the thigh. The extension in the knee is 0 degrees today and the strenght is significantly improved. During the elevation of pelvis, she is just able to elevate 2-3 cm up from the table due to weakness and probably because she is quite obese. It is necessary for improvement in this exercise due to the muscles that support the pelvis.

Self therapy:

- DVT prevention, 5 minutes every hour.
- Straight leg raise for strenghtening the quadriceps, elevate and hold for 3 seconds 3 times a day.
- Pillow under knee for ROM and isometric strenghtening of quadriceps, press down and hold for 5 seconds 3 times a day.
- Sliding heel towards buttock for ROM and isotonic strenghtening of hamstrings, repeat 20 times, 3 times a day.

Day to day Therapy – Day 7

Date: 13.02.14 **Time:** 13.00 PM.

Patients status before therapy:

The patient is very motivated for exercising and therapy, she walks very good down to the therapy room. She har been sleeping good and is not bothered with any pain to day eighter.

Goals of todays therapy:

- DVT prevention
- Soft tissue techniques
- Jointplay
- Isometric contractions
- Isotonic contractions
- PIR

Therapy proposal:

- Gait exercises for stability and strenght.
- Active movement in talocrural joint to increase the circulatory system for prevention of deep vein thrombosis.
- Soft tissue techniques for reduction of edema and release any restrictions in skin, subskin, fascia or muscles in right lower extremity.
- Mobilization of patella case of blockages.
- Isometric exercises with overball in supine position to strenghten vastus medialis, vastus intermedius, vastus lateralis, rectus femoris, adductor magnus, adductor brevis, adductor longus, pectineus, gracilis gluteal muscles and hamstrings.
- Isotonic exercises with overball in supine position to strenghten the hamstrings, lower abdominals, lower back, gluteal muscles and pelvic floor muscles.
- Eccentric exercise in supine position with Thera-band around knees to improve function of the internal rotators of hips.
- PIR for relaxation of the hypertoned muscles.

Therapy implementation:

- Gait exercises
    - In stairs with crutches
- DVT prevention

    - Plantar flexion of talocrural joint.
    - Dorsal flexion of talocrural joint.
    - Circumduction in both directions of talocrural joint.
- Soft tissue techniques
    - Softball in cranial direction
    - Stroking in cranial direction
    - Skinfold around longitudinal axis and folds for stretching of connective tissue.
- Jointplay
    - Patella
    - PIR (4 repetitions)
    - Adductors of thigh
    - Quadriceps
    - Iliopsoas
- PIR in supine position (5 rep.)
    - Adductors of thigh
    - Hamstrings
    - Iliopsoas
    - Piriformis
    - Quadriceps femoris
- Isometric contraction
    - Supine position with fitnessball under calfs with flexed knees for pressing down, 2x15 repetitions.
    - Overball under ankles in supine position and press towardt table, 2x20 repetitions.
    - Overball between knees for pressing together in adduction of the thighs, 2x15 repetitions.
- Isotonic contraction
    - Supine position with fitnessball under calfs with flexed knees, elevation of pelvis, 2x20 repetitions.
    - Overball between flexed knees in supine position, alternating elevates right and left foot so that calfs is in same line that thighs.

- Eccentric contraction according to Brügger concept
    - Thera-band crossing around knees, 2x10 repetitions.

Result:

Objective:

The strenghtening exercises is performed without any pain and the patient feels that she is mastering the exercises quite good now. She likes the given exercises good and feels fatigue after the therapy and exercises.

Subjective:

During the PIR she is able to hold during the isometric phase and relax longer in the relaxation phase, which makes the therpy very good for her adductors of thigh, quadriceps and iliopsoas. The strenghtening exercises has good improvement and she is able to perform them without any problems og pain. The strenghtening of the lower extremity makes her more stabile and secure during gait, and makes it easier for her to be more independent during ADL. Jointplay in patella is improved, but has some retrictions in all directions.

Self therapy:

- DVT prevention, 5 minutes every hour.
- Straight leg raise for strenghtening the quadriceps, elevate and hold for 3 seconds 3 times a day.
- Pillow under knee for ROM and isometric strenghtening of quadriceps, press down and hold for 5 seconds 3 times a day.
- Sliding heel towards buttock for ROM and isotonic strenghtening of hamstrings, repeat 20 times, 3 times a day.

Day to day Therapy – Day 8

Date: 14.02.14 **Time: 13.00**

Patients status before therapy:

Patient is without any pain. She is motivated and looking forward to exercise today.

Goals of todays therapy:

- DVT prevention
- Soft tissue techniques
- Isometric contractions
- Isotonic contractions
- PIR
- Jointplay

Therapy proposal:

- Gait exercises for stability and strenght.
- Active movement in talocrural joint to increase the circulatory system for prevention of deep vein thrombosis.
- Soft tissue techniques for reduction of edema and release any restrictions in skin, subskin, fascia or muscles in right lower extremity.
- Mobilization of patellae in case of blockages.
- Isometric exercises with overball in supine position to strenghten vastus medialis, vastus intermedius, vastus lateralis, rectus femoris, adductor magnus, adductor brevis, adductor longus, pectineus, gracilis, hamstrings and gluteal muscles.
- Isotonic exercises with overball in supine position to strenghten the hamstrings, lower abdominals, lower back, hamstrings, gluteals and pelvic floor muscles
- PIR for relaxation of the hypertoned muscles.

Therapy implementation:

- Gait exercises
    - In stairs with crutches
- DVT prevention
    - Plantar flexion of talocrural joint.
    - Dorsal flexion of talocrural joint.
    - Circumduction in both directions of talocrural joint.

- Soft tissue techniques
    - Softball in cranial direction
    - Stroking in cranial direction
    - Skinfold around longitudinal axis
    - Releasing of fascia
- Jointplay
    - Patella
- PIR (5 repetiotions)
    - Adductors of thigh
    - Quadriceps
    - Iliopsoas
- Isometric contraction
    - Supine position with fitnessball under calfs with flexed knees for pressing down, 2x20 repetitions.
    - Overball under ankles in supine position for pressing down towards table, 2x15 repetitions.
    - Overball between flexed knees and press together in adductors of the thigh, 2x20 repetitions.
- Isotonic contraction
    - Fitnessball under calfs with flexed knees in supine position, elevation of pelvis, 2x20 repetitions.
    - Overball between flexed knees, alternating elevates right and left foot so that calfs is in same line that thighs in supine position.
- Eccentric contraction according to Brügger concept
    - Thera-band crossing around knees to improve function of the internal rotators of hips, 2x12 repetitions.

Result:

Objective:

The patient performed the session without pain today.

Subjective:

The situation regarding PIR is the same as yesterday, she is able to hold during the isometric phase and relax longer in the relaxation phase. The elevation of pelvis is still very hard for her to perform, so it will be necessary to continue the work with

strenghtening the muscles for this movement. It could also be a good start to try to loose some weight.

Self therapy:

- DVT prevention, 5 minutes every hour.
- Straight leg raise for strenghtening the quadriceps, elevate and hold for 3 seconds 3 times a day.
- Pillow under knee for ROM and isometric strenghtening of quadriceps, press down and hold for 5 seconds 3 times a day.
- Sliding heel towards buttock for ROM and isotonic strenghtening of hamstrings, repeat 20 times, 3 times a day.

Note:

Patient is indicated to have motor-splint machine 60 min. a day, ergotherapy of hands and biolamp. This is performed daily under supervision and monitoring by the nurses and ergotherapists. Patient commonly had one session (30 min.) with the motor-splint in the morning, and one in the afternoon.

3.6 Final kinesiologic examination

Examination were performed 14.02.14

Changes from initial examination is marked green

3.6.1 Posture examination

(without plumbline/with cruthes)

The dorsal aspect:

	sin.	dx.
Roundness of heels:	Flat with eversion	Flat with eversion
Position of heels:	Narrow base	
Shape of achilles tendon:	Valgosity	Valgosity
Thickness of achilles tendon:	Not visible	Not visible
Shape of calfs:	Symmetrical round	
Position of knees:	Moderate valgus	Moderate valgus
Shape of thighs:	Symmetrical round	
Height of gluteal folds:	Decreased fold	Decreased fold
Tone of gluteal muscles:	Hypothrophic	Hypothrophic
Waist:	Wide and symmetrical	
Lumbar spine	Curvature to the sin.	
Thoracic spine	Curvature to the dx.	
Cervical spine:	Midline	
Scapluaes	Not visible	Not visible
Shoulders:	Slightly elevated	Slightly elevated
Neck:	Short and C7/Th1 is very prominent	
Head:	Shifted to dx.	

Table 17 Final posture examination, dorsal aspect

The lateral aspect:

	sin.	dx.
Shape of malleolus:	Pathological due to surgery, slightly visible	Slightly visible
Shape of calfs:	Symmetrical round	

Shape of knees:	Physiological	Slightly semiflexion
Shape of thighs:	Round	Round
Shape of buttock.	Flat	Flat
Abdomen	Slightly protracted	Moderate protracted
Lumbar curvature:	Hyperlordosis	
Thoracic kyphosis:	Hyperkyphosis	
Position of shoulders:	Protracted	
Cervical curvature:	Hyperlordosis	
Head	Protracted	

Table 18 Final posture examination, lateral aspect

The ventral aspect:

	sin.	dx.
Position of feets:	Narrow base	
Toes:	Abnormality of 4th toe	Abnormality of 4th toe
Longitudinal arch:	Flat	Flat
Transverse arch:	Flat	Flat
Position of ankles:	Moderate inversion	Moderate inversion
Knees:	Moderate valgosity + a big scar on patella	Moderate valgosity
Thighs:	Symmetrical	Symmetrical, slight hematome anteriomedially
The upper abdomen:	Prominent with a big scar at the level of 8th rib approx.	Prominent
The lower abdomen:	Prominent	Prominent (more than sin.)
Umbilicus:	Slightly shifted to dx.	
Sternum:	Midline	
Clavicles:	Symmetrical	
Supraclavicular fossa:	Sin. is deeper than dx.	
Shoulders:	Slightly elevated	Moderate elevated
Symmetry of face:	Sin. side is dropped more than dx.	
Face	Mild cushing face	

Hair:	Loss especially on sin. frontal lobe

Table 19 Final posture examination, ventral aspect

3.6.2 Pelvis examination

ASIS	Right is higher	Without pain
PSIS	Right is higher	Without pain
Crista	Right is higher	Without pain

Table 20 Final examination, pelvis examination

3.6.3 Gait examination

Performed with crutches

Forward walking:

	sin.	dx.
Feets:	Eversion of plantae.	Eversion of plantae, slightly decreased extension of ankle in heel strike is still present.
	Step length is bigger on sin. side. The time spent on each foot during stanice phase is approx. equal. She uses all of the phases in gait from heel strike to toe off with constant speed.	
Knees:	Moderate valgosity	Moderate valgosity
Hips:	Slightly decreased extension	Slightly decreased extension with less external rotation.
Lumbar area:	Slight limited movement	
Paravertebral muscles	Slight limited movement	
Upper trunk rotation	Rotates during gait	
Lower trunk rotation	Slight stiff due to crutches	

Table 21 Final examination, gait examination

3.6.4 Palpation

Lower Extremity:

	sin.	dx.
Skin:	No HAZ, temp. differences, skin color differences nor restrictions	Pathological barriere is still present but decreased. The skin temperature is normal. Hematome anteriomedially on thigh is slightly visible. Skin and scar is dry, the scar is not active anymore and is without stiches. The healingprocess of the skin is good.
Subcutaneus tissue and fascia:	No restrictions nor pain	Folding the skin arond the longitudinal axis on thigh and calf is performed without pain, but with slight restrictions 10 cm cranially and caudally to the knee-joint.
Muscles:	TrP in adductors of thigh, hamstrings and piriformis. No perioestal pain points, nor restrictions	Slight pain is still present, but significantly decreased superior border of patella, lateral acpect of distal thigh and proximal calf. Perioestal pain point on fibular head is not present. Trp in piriformis, triceps surrae, iliopsoas is slight. But still present in adductors of thigh. Hypotrophy of muscles in thigh and calf is decreased.

Table 22 Final examination, palpation

3.6.5 Examination of muscle lenght according to Janda

Muscle tested:	Grade:	
	sin.	dx.
Soleus:	0	1
Gastrocnemius:	0	0
Hamstrings:	0	1
Adductors of thigh:	0	1
Iliopsoas:	0	1
Tensor facia lata:	0	1
Rectus femoris:	0	1

Table 23 Final examination, muscle length

3.6.6 Examination of joint play according to Lewit

Joint:		Restrictions/blockages	
		sin.	dx.
DIP	2nd	No blockage	No blockage
	3rd	No blockage	No blockage
	4th	No blockage	No blockage
	5th	No blockage	No blockage
PIP	1st	No blockage	No blockage
	2nd	No blockage	No blockage
	3rd	No blockage	No blockage
	4th	No blockage	No blockage
	5th	No blockage	No blockage
MTP	1st	No blockage	No blockage
	2nd	No blockage	No blockage
	3rd	No blockage	No blockage
	4th	No blockage	No blockage
	5th	No blockage	No blockage
Lisfranc´s		No blockage	No blockage
Chopart´s		No blockage	No blockage

Subtalar	No blockage	No blockage
Talocrural	No blockage	No blockage
Tibiofibular	No blockage	No blockage
Patella	No blockage	No blockage

Table 24 Final examination, jointplay

3.6.7 Examination of antropometric measurements

Measured:	Centimeter			
			Deviation:	
	Sin.	Dx.	Sin.	Dx.
Malleolus:	30	29	0	+1
Metatarsal heads:	24	25	0	+0,5
Calf:	42	42	+1	0
Tibial tuberosity:	40	46	0	-1
Knee joint:	44	51	0	+1
Above knee:	45	52	0	-1
Vastus medialis:	50	55	+2	0
Quadriceps:	57	62	0	+1

Table 25 Final examination, antropometric measurements

3.6.8 Examination of muscle strenght according to Kendall

Muscle	Muscle Group	Position	Grade	
			sin.	dx.
Deltoid	Shoulder abductors	Sitting	5	5
Biceps brachii	Elbow flexors	Sitting	5	5
Wrist extensors	Extensor carpi ulnaris/radialis	Sitting	5	5
Wrist flexors	Flexor carpi ulnaris/radials	Sitting	5	5

Iliopsoas	Hip flexors	Sitting	5	5
Quadriceps femoris	Knee extensors	Sitting	5	4
Tibialis anterior	Ankle dorsiflexion	Sitting	5	4

Table 26 Final examination, muscle strength

3.6.9 Examination of range of motion

Degrees measured with goniometr

Joint measured	Active movement	Passive movement
Dx. MTP joints (all 5 joints)		
Flexion	40	50
Extension	50	70
Sin. MTP joints (all 5 joints)		
Flexion	40	50
Extension	40	60
Dx. Inversion of foot	30	40
Sin. Inversion of foot	35	45
Dx. Eversion of foot	15	20
Sin. Eversion of foot	20	25
Dx. talocrural plantar flexion	50	55
Sin. talocrural plantar flexion	50	55
Dx. talocrural dorsal flexion	25	30
Sin. talocrural dorsal flexion	20	30
Dx. knee extension	0	0
Sin. knee extension	0	0
Dx. knee flexion	120	125

Sin. knee extension	125	130
Dx. hip external rotation	50	55
Sin. hip external rotation	50	55
Dx. hip internal rotation	25	35
Sin. hip internal rotation	35	40
Dx. adduction of hip	15	20
Sin. adduction of hip	20	25
Dx. abduction of hip	35	40
Sin. abduction of hip	35	40
Dx. flexion of hip	115	125
Sin. flexion of hip	130	135
Dx. extension of hip	10	15
Sin. extension of hip	10	15

Table 27 Final examination, range of movement in lower extremities

3.6.10 Neurological examination

Dermatome sensation in lower extremities:

Dermatome	Sensation	
	sin.	dx.
L2	Physiological	Physiological
L3	Physiological	Physiological
L4	Physiological	Physiological
L5	Physiological	Physiological
S1	Physiological	Physiological
S2	Physiological	Physiological

Table 28 Final examination, dermatome sensation

3.6.11 Examination of deep tendon reflexes

Tendon tested:	Tendon reflex	
	sin.	dx.
Patellar (L2-4)	Physiological	Healing scar
Achilles (L5-S2)	Physiological	Physiological
Medioplantar (L5-S2)	Physiological	Physiological

Biceps tendon (C5)	Physiological	Physiological

Table 29 Final examination, deep tendon reflexes of lower extremities

3.7 Conclusion of final kinesiologic examination

Posture examination

In the final posture examination, patients earlier analgetic posture is practically gone. She is able to stand on her own just with slight support for balance from her crutches, this indicate that her pain is marked decreased and her strenght in lower extremities has improved alot. The posture is still influenced by the kyphotic/lordotic posture, but her allignment is much better, which again will decrease her chances of having secondary changes of the musculoskeletal system over time. Her more correct posture in the final kinesiologic examination decreases the potential of exsessive stress on bones, joints, ligaments and muscles. The weight seems equal distributed on both feets and her earlier marked valgosity in knees is decreased. The cause of decreases valgosity is probably due to elongated and more relaxed adductor muscles and stronger antagonists since first examination. The hipflexors is more relaxed and elongated due to the upright posture.

Pelvis examination

The results from pelvic examination is similar to the initial examination, right PSIS, ASIS and crista is higher than on the left side. The examination is now without any pain. After measuring the leg lenght, the difference was 0,5 cm. in anatomical length and symmetrical in functional length, due to the tricky correct measurement of leg lenght as discribed in initial conclusion, pelvic obliquity is a reliable clinical sign of difference in leg length. In a case with pelvic obliquity, typically we find the shoulder lower on the same side that the pelvis is higher, but in this patient the shoulder is still elevated slightly. Crutches can for sure be a factor that makes the shoulder elevated. The difference in leg length can be caused by the endoprostesis of knee.

Gait examination

Gait is performed with constant speed, equal time spent on each foot during the step phases. The step lenght is still a bit longer with the left foot. Patient is able to walk quite good, but the reason for the short right foot step is anxiety to pain. Eversion of plantae is still present, but the dorsal flexion of ankle in heel-strike is improved.

Circumduction of right foot with slight external rotation is imroved by far, she is now able to flex the knee and dorsiflex the ankle without major pain. The gait is more stabile and influenced of her obtained strength and motorcontrol in lower extremities. Patients valgosity in knees are still slight present and her extension of hip joint during gait is increased due to more relaxed/elongated antagonists, which allows the trunk movement to be slight more fluent and physiological.

Palpation examination

The palpation of right lower extremity shows that the pathological barriere in skin is decreased but present. The skin temperature is now physiological and the hematoma anteriomedially on thigh is slightly visible and not very painful. Patient still has some swelling in her foot. Both the skin and scar is dry, and the scar is without stitches and is not active anymore. Subcutaneus tissue and fasciae is restricted approximately 10 cm. caudal and cranial to the knee joint, but folding the tissue around the longitudinal axis of lower extremities is performed without any pain. Palpation of the superior and inferior border of patella provokes still slight pain. periosteal pain in fibular head is gone. Painful TrP found in the piriformis, biceps femoris, triceps surae and iliopsoas is slight present, but still very painful in patients adductors of thigh. Hypotrophy of the muscles is improved. In the left lower extremity TrP are gone in adductors of thigh, piriformis and hamstrings.

Muscle lenght examination

The length examination on right lower extremity shows that the short/taut adductors of thigh, iliopsoas, rectus femoris and tensor fasciae latae has improved from marked shortness to moderate shortness. The thigh is now below horizontal plane during examination of length. This inducate that especially the PIR had a good influence on the muscles and was able to improve the length and the ability to relax the muscles. This improvement have a good influence on the standing posture as mentioned and symmetry of agonist and antagonists. Due to the improved muscle length in adductors of thighs, the valgosity in knees is also improved.

Jointplay examination

Final examination of joints indicate no blockages, although there is still some restrictions in right patella from day to day. There is not detected any unevenness or

roughness in the gliding movement of patella. The factor for better jointplay is probably due to patients improved movement pattern and better balance of muscle function between agonists and antagonists.

Antropometric measurements examination

Small differences are found in the final examination of antropometric measurement. The findings varies from increased to decreased measurements, compared to initial examination and the 5th day of therapy. The circumference of lower extremities is influenced by the muscletone and swelling. So palpation taken into consideration with antropometric measurements indicates that the swelling has decreased a lot and the muscletone has improved slightly. The 5th day was also affected by increased swelling which gave patient a recurrence, and gives the final measurements less improvement than expected.

Muscle strength examination

The muscle test is performed in sitting position and similar to the initial examination. There is improvement in strenght for hip flexors, knee extensors and dorsiflexor of ankle. Patient is now able to hold against strong pressure in all musclegroups except the knee extensors and dorsiflexors of ankle which is against moderate pressure. The strengthening exercises should continue and have focus on these muscles aswelll.

Range of motion examination

The examination results for lower extremities indicate increased range of motion ecpesially in the right leg. Knee extension and hip flexion is the joints with the best improvement and is now considered physiological. The improvements in active range of movement is caused by increased muscle strength and less pain during movement, while the passive range of movement is improved by the change in joint space and joint structure. The range of motion in left ankle is improved slight, but will never remain physiological range of movement due to the osteosynthesis of malleolus. The range of motion final examination includes the flexion of knee and extension of hip in prone position, which also is considered physiological now.

Neurological examination

Results is physiological in all dermatomes tested.

Deep tendon reflexes examination

Results is physiological in all deep tendons tested, with the exception of patellar tendon right side due to the scar.

3.8 Evaluation of the effect of the therapy

Comparison of initial and final examination in relation to rehabilitation plan:

Initial Examination	Final Examination
Posture examination: Dorsal aspect sin. side: Marked valgus of knee Dorsal aspect dx. side: Marked valgus of knee Shoulders moderate elevated Ventral aspect dx. side: Knees in marked valgosity Thigh symmetrically round, big hematoma medially	**Posture examination:** Dorsal aspect sin. side: Moderate valgus of knee Dorsal aspect dx. side: Moderate valgus of knee Shoulders slightly elevated Ventral aspect dx. side: Knees in moderate valgosity Thigh symmetrically round, slightly hematoma medially
Pelvis examination PSIS: Right is higher, with bilateral pain	**Pelvis examination** PSIS: Right is higher, without pain
Gait examination Sin. side: Step length is bigger on sin. side and increased time is spent in the stanice phase on sin. foot. No rolling movement on feets during gait. Speed is not constant	**Gait examination** Sin. side: Step length is bigger on sin. side. The time spent on each foot during stanice phase is approx. equal. She uses all of the phases in gait from heel strike to toe off with

	constant speed.
Decreased extension in hip Lumbar area has limited movements Paravertebral muscles has limited movements. Lower trunk rotation is limited due to crutches. <u>Dx. side:</u> Eversion of plantae, decreased extension of ankle in heel strike is present. Step length is bigger on sin. side and increased time is spent in the stanice phase on sin. foot. No rolling movement on feets during gait. Speed is not constant	Slightly decreased extension hip extension Lumbar area has slight limited movements Paravertebral muscles has slight limited movements. Lower trunk rotation is slight limited due to crutches. <u>Dx. side:</u> Eversion of plantae, slightly decreased extension of ankle in heel strike is still present. Step length is bigger on sin. side. The time spent on each foot during stanice phase is approx. equal. She uses all of the phases in gait from heel strike to toe off with constant speed.
Decreased extension in hip with moderate external rotation. Lumbar area has limited movements Paravertebral muscles has limited movements. Lower trunk rotation is limited due to crutches.	Slightly decreased extension with less external rotation. Lumbar area has slight limited movements Paravertebral muscles has slight limited movements. Lower trunk rotation is slight limited due to crutches.
<u>Palpation</u> <u>Dx. side:</u> Skin has pathological barriere and increased temp. lateral and cranial to knee joint. Swollen in whole lower extremity and a big hematome anteriomedially on thigh. Skin is dry. Sterile bandage on scar and painfull in the hematoma area on thigh. Subcutaneus tissue and fascia: Folding the	**<u>Palpation</u>** <u>Dx. side:</u> Skin has pathological barriere is still present but decreased. The skin temperature is normal. Hematome anteriomedially on thigh is slightly visible. Skin and scar is dry, the scar is not active anymore and is without stiches. The healingprocess of the skin is good. Subcutaneus tissue and fascia: Folding the

skin arond the longitudinal axis shows barriere in both directions on both calf and thigh. Muscles Pain superior border of patella, lateral acpect of distal thigh and proximal calf. Periosteal pain point on fibular head. Trp in piriformis, triceps surrae, biceps femoris, iliopsoas and adductors of thigh. Hypotrophic and hypertone muscles in thigh and calf.	skin arond the longitudinal axis on thigh and calf is performed without pain, but with slight restrictions 10 cm cranially and caudally to the knee-joint. In muscles slight pain is still present, but significantly decreased superior border of patella, lateral acpect of distal thigh and proximal calf. Perioestal pain point on fibular head is not present. Trp in piriformis, triceps surrae, iliopsoas is slight. But still present in adductors of thigh. Hypotrophy of muscles in thigh and calf is decreased.
Muscle Length examination Dx. side: Adductors of thigh, 2 Iliopsoas, 2 Tensor facia lata, 2 Rectus femoris, 2	**Muscle Length examination** Dx. side: Adductors of thigh, 1 Iliopsoas, 1 Tensor facia lata, 1 Rectus femoris, 1
Joint play examination Sin. side: PIP 1st ventral blockage Patella, Cranial/caudal blockage Dx. side: Patella, cranial/caudal/medial/lateral blockage	**Joint play examination** Sin. side: PIP 1st no blockage Patella, no blockage Dx. side: Patella, no blockage
Antropometric measurements (cm.) Sin. side: Calf: 41 Vastus medialis: 48 Dx. side: Malleolus: 28 Metatarsal heads: 24,5	**Antropometric measurements (cm.)** Sin. side: Calf: 42 Vastus medialis: 50 Dx. side: Malleolus: 29 Metatarsal heads: 25

Tibial tuberosity: 47 Knee joint: 50 Above knee: 53 Quadriceps: 63	Tibial tuberosity: 46 Knee joint: 51 Above knee: 52 Quadriceps: 62
Muscle strenght examination Sin. side: Iliopsoas, 4 Ankle dorsiflexion, 4 Dx. side: Iliopsoas, 4 Quadriceps femoris, 3 Ankle dorsiflexion, 3	**Muscle strenght examination** Sin. side: Iliopsoas, 5 Ankle dorsiflexion, 5 Dx. side: Iliopsoas, 5 Quadriceps femoris, 4 Ankle dorsiflexion, 4
Examination of range of motion In degrees: Dx. talocrural plantar flexion AROM, 45 Dx. talocrural plantar flexion PROM, 50 Sin. talocrural plantar flexion AROM, 45 Sin. talocrural plantar flexion PROM, 50 Dx. talocrural dorsal flexion AROM, 15 Dx. talocrural dorsal flexion PROM, 25 Sin. talocrural dorsal flexion AROM, 15 Sin. talocrural dorsal flexion PROM, 25 Dx. knee extension AROM, -20 Dx. knee extension PROM, not measureable Dx. knee flexion AROM, 80 Dx. knee flexion PROM, 85 Dx. hip external rotation AROM, 45 Dx. hip external rotation PROM, 50 Dx. hip internal rotation AROM, 20 Dx. hip internal rotation PROM, 30 Dx. hip adduction AROM, 10 Dx. hip adduction PROM, 15	**Examination of range of motion** In degrees: Dx. talocrural plantar flexion AROM, 50 Dx. talocrural plantar flexion PROM, 55 Sin. talocrural plantar flexion AROM, 50 Sin. talocrural plantar flexion PROM, 55 Dx. talocrural dorsal flexion AROM, 25 Dx. talocrural dorsal flexion PROM, 30 Sin. talocrural dorsal flexion AROM, 20 Sin. talocrural dorsal flexion PROM, 30 Dx. knee extension AROM, 0 Dx. knee extension PROM, 0 Dx. knee flextion AROM, 120 Dx. knee flexion PROM, 125 Dx. hip external rotation AROM, 50 Dx. hip external rotation PROM, 55 Dx. hip internal rotation AROM, 25 Dx. hip internal rotation PROM, 35 Dx. hip adduction AROM, 15 Dx. hip adduction PROM, 20

Dx. hip abduction AROM, 25 Dx. hip abduction PROM, 30 Dx. hip flexion AROM, 100 Dx. hip flexion PROM, 115 Sin. hip flexion AROM, 125 Sin. hip flexion PROM, 130 Dx. hip extension AROM, not measureable Dx. Hip extension PROM, not measureable Sin. hip extension AROM, not measureable Sin. Hip extension PROM, not measureable	Dx. hip abduction AROM, 35 Dx. hip abduction PROM, 40 Dx. hip flexion AROM, 115 Dx. hip flexion PROM, 125 Sin. hip flexion AROM, 130 Sin. hip flexion PROM, 135 Dx. hip extension AROM, 10 Dx. Hip extension PROM,15 Sin. hip extension AROM, 10 Sin. Hip extension PROM, 15
Examination of deep tendon reflexes Dx. side: Patellar (L2-4), - sutures and sterile bandage	**Examination of deep tendon reflexes** Dx. side: Patellar (L2-4), healing scar

Table 30 Comparison of initial and final examination

The therapy performed for the patient seems to have quite good results, the postural final examination indicates that she is now able to have a more alligned standing position without provoking any pain, neighter in her hips or knees. This is a result of muscle strength, symmetry and balance of the locomotor system as mentioned in the conclusion. Regarding gait she is able to walk the stairs with good strenght and stability, and the results for the final muscle strength evaluation shows us that she has improved in all muscle groups that needed improvements. It is still not clear to me if the patient has leg length differences, the examination indicates pelvic obliquity in both initial and final results, but no difference in the antropometric measurements. Probably her right leg is a bit longer than the left, to be sure about this I would recommend a new examination when the patient is used to weight-bearing on her right foot, so this is not a causative factor. The strengthening exercises where the patient really have pushed her self, have given good results, not only in regaining strength, but also the important factor for ADL, namely the range of motion. The newly regained range of motion is

what we should be very pleased with, e.g we can se that she went from 80 degrees active knee flexion to 120 degrees in 8 days. She increased the range of motion in all joints, in all planes for her right operated leg. Ovarall she has improved in all the decreased functions she had first day of therapy. The progression of the soft tissues (except muscles) and the swelling is not satisfactory due to the increased swelling especially day 5, and the final results which indicates practically same circumference as in the initial examination. Except from this, evaluation and summary of the therapy progress is that the provided therapeutic techniques was overal quite successfull.

4 Conclusion

When I came to Revmatologický ústav for my practice, I had the possibility to choose between some patients. The reason for choosing J.P as my patient was that I could meet her the first day she was admitted to the clinic, and nevertheless follow her rehabilitation for 8 days. In this way it may be easier for us to build up mutual trust and respect, and we both have to work after eachothers expectations. By choosing a patient from first day in the clinic also gave me the perfect opportunity to see improvements and progression from the beginning. Totally we had 8 sessions together during my practice, and despite some communication problems due to the language barrier, we were able to work good along. I was able to use examinations and therapy techniques that I learned in school, in addition to some new techniques my supervisor introduced me to.

The therapy we choosed for the patient was successull in the sense of patients cooperativeness and motivation. Some of the performed therapies was hard for the patient to carry out, and some she experienced as plesant. The PIR was beneficial for the patient in the sense of ability to relax the muscles, but the progression was slow. Strength exercises has been as a benefit through the ability to climb stairs, corrected allignment of locomotor system especially in standing position, coordination, motor skills and overall function for a improved ADL. However, I have learned alot about examination and therapies regarding the rehabilitation phase after total knee replacement. During my work, I have collected relevant theory about osteoarthritis of knee and the disadvantages and advantages of having a total knee replacement. The most exciting part of my work in my opinion, as mentioned, was that I had the opportunity to work with the patient from the beginning. It was a good feeling that I could be a part of the team who work for improvement, facilitating and planning for J.P as an individual and be able to take care of and see her needs during her hospitalization.

In my opinion J.P has good prognosis for her knee. Her motivation and eager to improve is the fastest way back to ADL, and she is quite young. Her expectations and needs for the knee is quite low, since she has a low activity level, but with motivation, exercises and follow-up she will probably have a good, stabile and strong knee for several years.

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6 Supplement

6.1 Informed consent form

INFORMOVANÝ SOUHLAS

V souladu se Zákonem o péci o zdraví lidu (§ 23 odst. 2 zákona c.20/1966 Sb.) a Úmluvou o lidských právech a biomedicíne c. 96/2001, Vás žádám o souhlas k vyšetrení a následné terapii. Dále Vás žádám o souhlas k nahlížení do Vaší dokumentace osobou získávající zpusobilost k výkonu zdravotnického povolání v rámci praktické výuky a s uverejnením výsledku terapie v rámci bakalárské práce na FTVS UK. Osobní data v této studii nebudou uvedena.

Dnešního dne jsem byla odborným pracovníkem poucena o plánovaném vyšetrení a následné terapii. Prohlašuji a svým dále uvedeným vlastnorucním podpisem potvrzuji, že odborný pracovník, který mi poskytl poucení, mi osobne vysvetlil vše, co je obsahem tohoto písemného informovaného souhlasu, a mela jsem možnost klást mu otázky, na které mi rádne odpovedel.

Prohlašuji, že jsem shora uvedenému poucení plne porozumela a výslovne souhlasím s provedením vyšetrení a následnou terapií. Souhlasím s nahlížením níže jmenované osoby do mé dokumentace a s uverejnením výsledku terapie v rámci studie.

Datum:..... Osoba, která provedla poucení:..... Podpis osoby, která provedla poucení:..... Vlastnorucní podpis pacienta /tky:.....

6.2 List of tables

6.3 List of abbreviations

ADL = Activities of daily living

AROM = Active range of motion

ASIS = Anterior superior iliac spine

Cm. = Centimeter

CZ = Czech

DVT = Deep vein trombosis

Dx. = Dexter

EN = English

FTVS = Fakulta Telesne Vychovy a Sportu

L = Lumbar, e.g. L1 =1st lumbar vertebrae

Nm = nanometer

NSAIDs = Nonsteroidal anti-inflammatory drugs

PIR = Post-isometric relaxation

PROM = Passive range of motion

PSIS= Posterior superior iliac spine

S = Sacrum

Sin. = Sinister

TrP = Trigger-points

6.4 Ethics board committee documentation