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FACULTY OF PHYSICAL EDUCATION AND SPORT
DEPARTMENT OF PHYSIOTHERAPY

**Case Study of Physiotherapy Treatment of a Patient with the Diagnosis
of Polyarthrititis after Total Hip Replacement**

BACHELOR DEGREE PROGRAM IN PHYSIOTHERAPY

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ABSTRACT

Title of the thesis: Case study of physiotherapy treatment of a patient with the diagnosis of polyarthritis after total hip replacement

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Work placement: Revmatologický Ustav in Prague

Summary

In this bachelor thesis, which was written and composed by myself, it is divided in two parts, the theoretical part and the special part.

Theoretical part describes the anatomy of the hip joint, specifically the bones, muscles, ligaments, nerves and blood supply of the hip joint. Information about kinesiological and biomechanical point of view is also discussed. In the practical part I analyse every procedure I have done with my patient, all the examinations, conclusions, therapies and results.

The last part of my bachelor thesis it is composed from my bibliography, which contains the literature, which I used to write the general part of my bachelor thesis. It contains also the list of figures and tables from the whole thesis and the abbreviations and finally the last thing is the ethics committee.

Keywords: hip joint, coxarthrosis, polyarthritis, total hip replacement, range of motion, exercise

DECLARATION

I declare that this bachelor thesis was written by me independently and by the instructions of my supervisor Mgr. Helena Vomáčková. It is an original research, which refers on practice with patient after total endoprosthesis of right hip due to coxarthrosis, under the supervising of Mgr. Maja Špiritovič. My practice took place at Revmatologický Ústav in Prague.

I also state that all the information, examination and therapeutic procedures, which are presented on this bachelor thesis, were performed based on my knowledge that I received from the professors of the Charles University in Prague. The information that I used to write this bachelor thesis was sourced from the list of literature, which exists at the end of the thesis.

Finally, I also declare that no invasive methods were used during my clinical practice and that the patient was fully aware of the examinations and therapeutic procedures at any time.

ACKNOWLEDGMENT

First of all, I would like to thank all of my professors that educated and helped me during the last 3 years of my studies in Charles University. I also want to express my special thanks to Mgr. Helena Vomáčková for guiding me through my bachelor thesis and supervision, which is much appreciated. Also, to Mgr. Maja Spiritovic who guide me and help me to complete the practical part of my bachelor thesis.

DEDICATION

First of all, I would like to dedicate this bachelor thesis to my family for giving me the opportunity to study physiotherapy in Charles University and fulfill my dream of becoming a physiotherapist. Also for their valuable support during my studies. Finally, I would like to thank my fellow classmates for the motivation and help during the academic years.

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1. Introduction

My physiotherapy program took place at Revmatologický Ustav in Albertov. Physiotherapy program started on Monday 12th of January 2015 and ended on Friday 23rd of January 2015.

The case study of physiotherapy treatment that I chose was for a patient with Total Hip replacement due to coxarthrosis, 10 days after the operation. I chose for my bachelor thesis this patient, because this surgery is very common and especially in older patients so I wanted to be more experienced on how to deal with those patients.

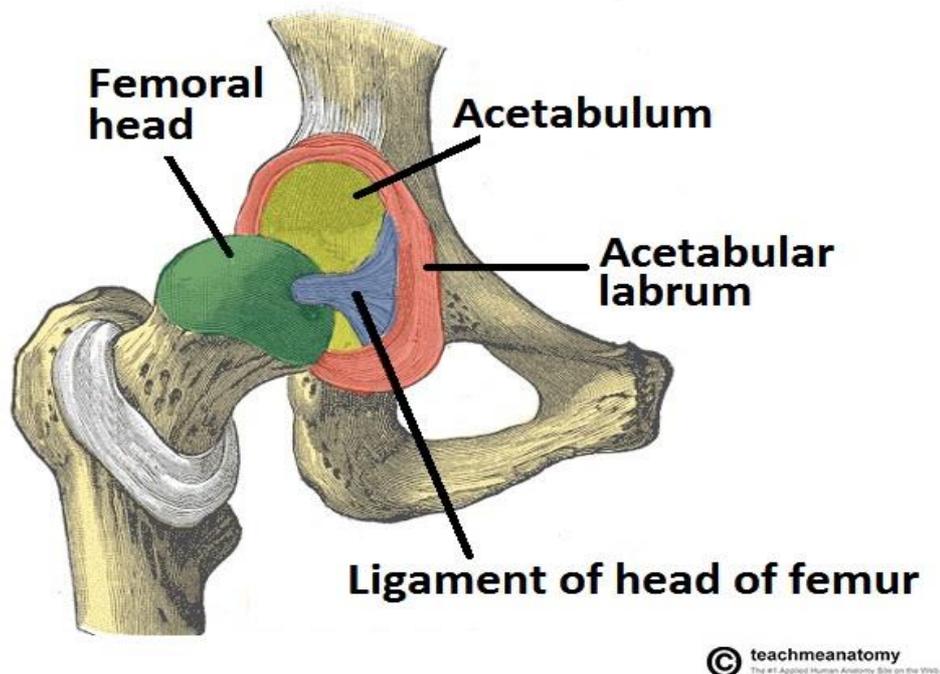
Goals of the therapy sessions were to decrease pain and swelling, increase range of motion, and strengthen the operated hip joint.

Thesis is divided into two parts, theoretical and practical part. Theoretical part describes the anatomy of the hip joint, specifically the bones, muscles, ligaments, nerves and blood supply of the hip joint. Information about kinesiological and biomechanical point of view is also discussed. In the practical part of the bachelor thesis, the examinations and the therapy progress of the patient is described. Patient's anamnesis, previous rehabilitation, physicians prescribe, indication of rehabilitation, initial kinesiological examination, short-term and long-term rehabilitation plan, therapy progress, final kinesiological examination, conclusion of examination and evaluation of the effect of the therapy are mentioned.

2. General part

2.1. Anatomy of the hip joint

Hip joint is ball and socket synovial type of joint. It arises as a consequence of articulation between the acetabulum of the pelvis and the head of the femur. The ilium is found at the rear of the hip joint while the ischium is found at the lower front of the joint. The pubis is found above the joint. The hip joint serves a major function of connecting the lower limb to the girdle of the pelvic (11). The anatomy of the joint indicates that it is designed to bear weight based on the fact that a big kind of movement for this joint is sacrificed for steadiness. The hip joint is composed of various structures. The key anatomical structures of the joint include articulating surfaces. (28)



Picture 1- general anatomy and bones of the hip joint (10)

2.1.1 Bones of the hip joint

The hip joint is made up of an acetabulum structure that resembles a cup on the lateral part of the pelvis and a hemispherical head that is found at the end of the femur bone. The head of the femur completely fits in the concavity of the acetabulum to form a stable joint that is capable of rotating at 360 degrees. The acetabulum and femur head are shielded by an articular cartilage that is usually thicker at the weight bearing places. Hip joint capsule is another important anatomical structure that serves an important

purpose of ensuring that the joint is strong. Musculature and strong ligaments that reinforce the joint serve significant purposes of ensuring that the joint is firm and stable. Unlike the shoulder joint that is weak due to its articular capsule, the hip joint capsule is a significant backer of joint steadiness. The hip joint capsule is usually denser anterosuperiorly where the main pressure of weight bearing occur. The capsule is thinner posteroinferiorly (1,10).

2.1.2. Ligaments of the hip joint

Ligaments form one of the most important components of the hip joint due to the key function that they serve in the joint. Ligaments ensure that the joint is stable even in cases where it is subjected to weight pressure. Hip joint ligaments can be categorized into two groups that include intracapsular and extracapsular ligaments. The only type of intracapsular ligament that is found in the hip joint is the ligament of the head of the femur. This ligament is moderately small and runs from the acetabular fossa of the pelvic to the fovea of the femur bone. Ligament of the head of the femur serves an important purpose of enfolding a branch of the obturator artery, which on the other hand carries a small amount of the hip joint blood. (1, 25)

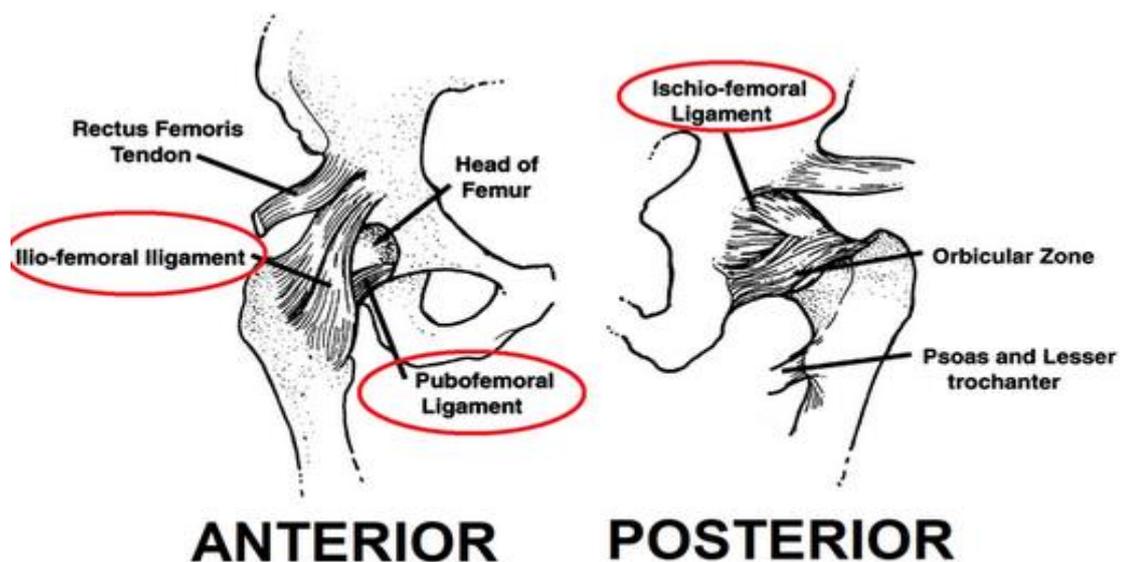
There are four kinds of extracapsular ligaments that are found in the hip joint. These extracapsular ligaments are continuous with the external surface of the hip joint capsule. They include:

- **Ligamentum Teres:** this is the first type of ligament that is found in the hip joint. The ligament is entirely located in the hip joint. It covers the hip where it runs from the end of the acetabulum to the fovea capitis of the femur where it then connects the femoral head to the inferior acetabular edge. The ligament is also joined with blood vessels and nerves that cross to the femoral head. The vascular section of this structure is vital during growth, but is less important in children. Ligamentum Teres becomes rigid during external rotation and adduction of the leg. It slightly contributes to the strength of the joint.
- **Ischio-femoral Ligament:** this is the second type of ligament that is found in the hip joint. It is the only type of ligament that is found on the posterior end of the hip. Ischio-femoral Ligament serves an important purpose of attaching the posterior side of the acetabulum rim and labrum. It winds itself around the joint and then insert on the anterior part of the femur bone. The position and

orientation of Ischio-femoral Ligament strengthens the joint capsule at the posterior end and at the same time prevents the hip joint from extending too much.

- Ilio-femoral Ligament: It attaches itself to the anterior inferior iliac spine and then moves out to the intertrochanteric contour of the femur where it attaches itself. Ilio-femoral ligament is one of the resilient ligaments of the body where it serves an important purpose of ensuring that the hip does not extremely extend. The ligament also checks on adduction of superior fibers and abduction of the inferior fibers. Furthermore, the ligament allows the body to maintain its upright posture by decreasing the necessity of muscle contraction. This is done by limiting the extension of the hip.
- Pubofemoral Ligament: this is the fourth ligament of the hip joint. Pub femoral Ligament is situated on the anterior part of the joint where it arises from the anterior part of the pubic ramus and then pass to the surface of the anterior intertrochanteric fossa. The central purpose of this ligament is to check on hip abduction and extension. It blends well with iliofemoral ligament. The diagram below indicates the major ligaments of the hip joint.

(1, 25)



Picture 2- anterior and posterior ligaments of hip Joint (15)

2.1.3. Muscles surrounding hip joint

Thigh and lower back muscles are the most prominent hip muscles that work together to stabilize the hip joint. They also serve as an important purpose of aligning the hip joint and keeping it moving. The four types of movement that are supported by hip muscles include flexion, extension, abduction and adduction. The muscles that surround the hip joint are categorized into three basic categories based on their location. Anterior muscles are found onto the front while posterior muscles are found on the back of the joint. Lateral muscles are found on the outside of the joint. The following are the main muscles that surround the hip joint:

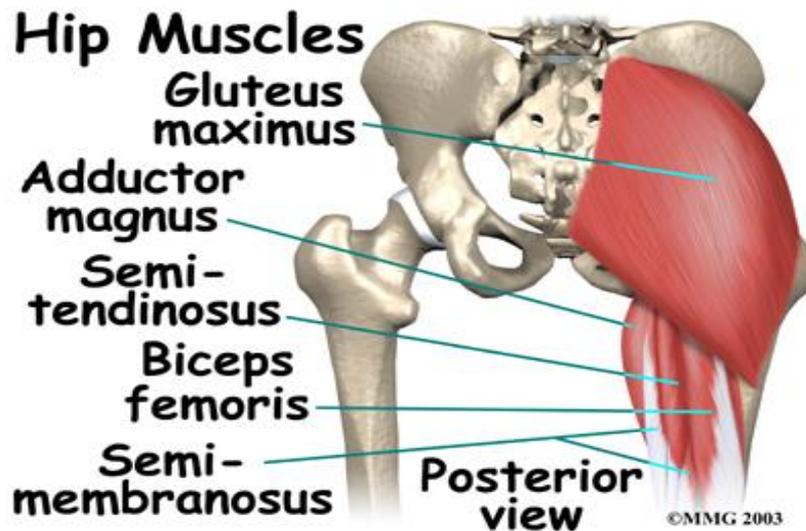
- **Gluteus maximus:** gluteus maximus is one of the common muscles that surround the hip joint. The muscle is located in the buttocks and it is regarded as one of the thickest muscles of the human body. In specific terms, gluteus muscle originate from the lower posterior iliac crest and posterior surface of the sacrum and then inserts on gluteal tuberosity that is found on the upper and posterior segment of the femur and iliotibial band. Gluteus maximus allow the hip to extend and at the same time facilitate the external rotation of the hip. The upper fibers of the muscle help in abduction while the lower fibers help in adduction.
- **Gluteus medius:** this is the second type of muscle that surround the hip joint. Gluteus medius originate from the external surface of the ilium in between the iliac crest. Posterior gluteal line is found above the muscle while anterior gluteal line is found below the muscle. It is significant to acknowledge that gluteus medius starts in the gluteal aponeurosis that shields its outer surface and it serves an important purpose of abducting the hip. The anterior fibers of the muscle help in flexing the hip and internal rotation while the posterior fibers aid in external rotation and also extension of the hip.
- **Gluteus minimus:** this is another muscle that surrounds the hip joint. Gluteus minimus originate from the external surface of the ilium below the gluteus medius and then insert on the greater trochanter of the femur bone. This muscle serves an important function of abducting the hip and also internal rotation. The muscle also serves to flex the hip.
- **Biceps femoris:** this muscle is found on the lateral part of the hip joint. It has two origins where the long head originates from the ischial tuberosity while the short head starts from lower half of linea aspera. Biceps femoris insert on the

head of the fibula. This muscle serves an important purpose of extending the hip and allowing the external rotation of the hip.

- Semitendinosus: this muscle is found on the superficial and medial side of the hip joint. Semitendinosus originate from ischial tuberosity and insert on the medial surface of the proximal edge of the tibia bone. They serve an important purpose of extending of the hip and facilitating interior rotation of the hip.
- Semimembranosus: this muscle is found on the medial side of the hip joint but deeper than semitendinosus. The muscle originates from the ischial tuberosity and inserts on the medial surface of the tibia bone. Its serves an important purpose of extending the hip and also internal rotation of the hip joint.
- Sartorius: Sartorius muscle originates from the anterior-superior spine of the ilium and inset on the anterior part of the tibia's medial condyle. This muscle serves an important purpose of flexing and abducting the hip. It also serves an important role of facilitating the external rotation of the hip.
- Quadriceps femoris: rectus femoris, vastus medialis, vastus intermedius and vastus lateralis are attached inferiorly to the tuberosity of tibia. Rectus femoris originates from the anteroinferior iliac spine and flexes the knee and hip joint. Vastus medialis originates at the medial lip of the linea aspera and extends the leg. Vastus intermedius is found on the distal half of the linea aspera and distal half of the intertrochanteric line and its function is to extend the knee. Vastus lateralis is found on the lateral lip of linea aspera and its role is to extend and stabilize the knee.
- Iliopsoas muscle: is the primary hip flexor, cross the hip joint and insert to the lesser trochanter of femur.

Other muscles that surround the hip joint include gracilis, adductor magnus, adductor longus, adductor brevis, pectineous, and tensor fascia latae.

(1,7,15,26)



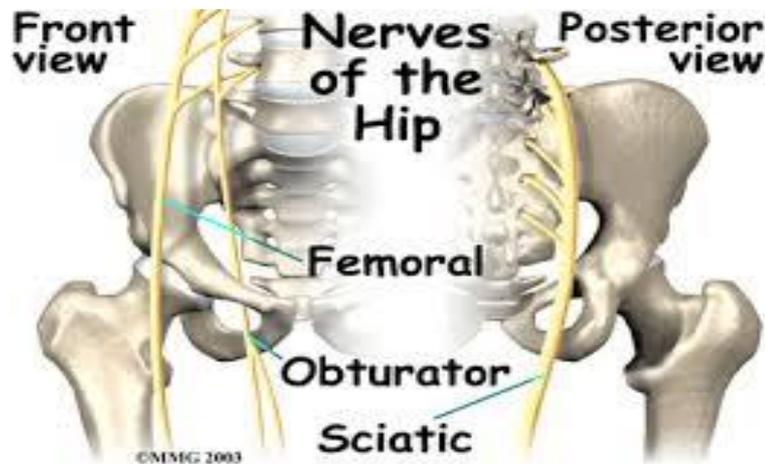
Picture 3- muscles that surround the hip joint from the posterior view (10)

2.1.4. Nerves surrounding hip joint

There are various nerves that innervate the muscles in the hip region. These nerves include obturator nerve, femoral nerve, sciatic nerve and lateral femoral cutaneous nerve. Obturator nerve originates from the medial edge of the psoas main muscle. It travels via the obturator foramen before it enters the thigh, where it divides into two parts that are known as anterior branch and posterior branch. Obturator nerve enhances the motor function of the knee and hip. It is also in charge of sensation in the thigh region. Sciatic nerve is the second and most commonly known nerve of the hip and thigh. Sciatic nerve is big and its size is approximately that of the thumb. Sciatic nerve travels below the gluteus maximus up to the back section of the leg where it then branches and move down up to the foot. The nerve is in most cases injured when there is dislocation of the hip. (1)

Nerves of the hip joint play an important role of conveying impulses from the brain to the hip muscles in order to facilitate movement. The nerves also convey signals from the hip to the brain about the issues of pain, stress and heat. Lateral femoral cutaneous nerve is another important nerve that innervates the hip. It is a division of lumbar plexus that occurs in the spinal cord in between Lumbar 2 and Lumbar 3 vertebrae. The anterior division of the lateral femoral cutaneous nerve innervates the skin of the lateral and interior areas of the thigh. The posterior division innervates the lateral section of the thigh, which starts from the hip's greater trochanter to midthigh. Femoral nerve on the other hand acts as the only femoral nerve that

innervates the muscles of the thigh. It sends signals that are responsible for leg functions such as running, walking and standing. (29)

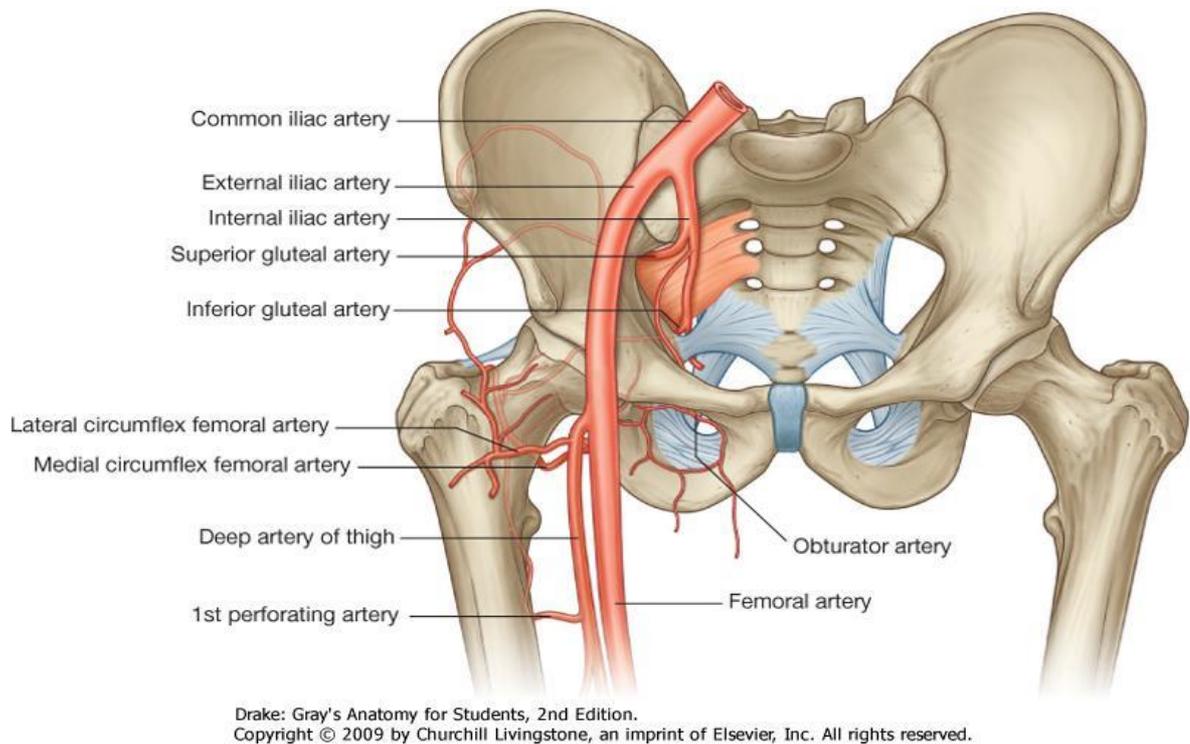


Picture 4- the nerves of the hip from the posterior view (16)

2.1.5. Blood supply of the hip joint

There are different blood vessels that supply the hip joint. The primary vessels that supply the hip joint include external and internal iliac arteries, obturator artery, inferior and superior gluteal arteries and femoral artery. Femoral artery is more common due to the critical role that it plays in cardiac cath. Femoral artery moves from the hip down to the leg and knee. It serves an important purpose of supplying the femoral head through its branches. External iliac artery passes below inguinal ligament on the inferior portion of the abdomen where it develops into femoral artery. Its main function is to supply the legs. Internal iliac artery generally branches into other smaller arteries that supply numerous pelvic muscles, buttock muscles and external sex organs. Important divisions in this case include iliolumbar artery that supply the ilium and back muscles, superior and inferior gluteal arteries that supply the gluteal muscles, skin of the buttocks and pelvic tissue. Obturator artery is a division of internal iliac artery that is found antero-inferiorly on the lateral wall of the pelvis. (1, 21)

The artery travels to the upper segment of obturator foramen where it escapes from the pelvic fissure via obturator canal. Obturator nerve serves an important role of supplying the obturator externus muscle, femur and medial section of the thigh. (21)



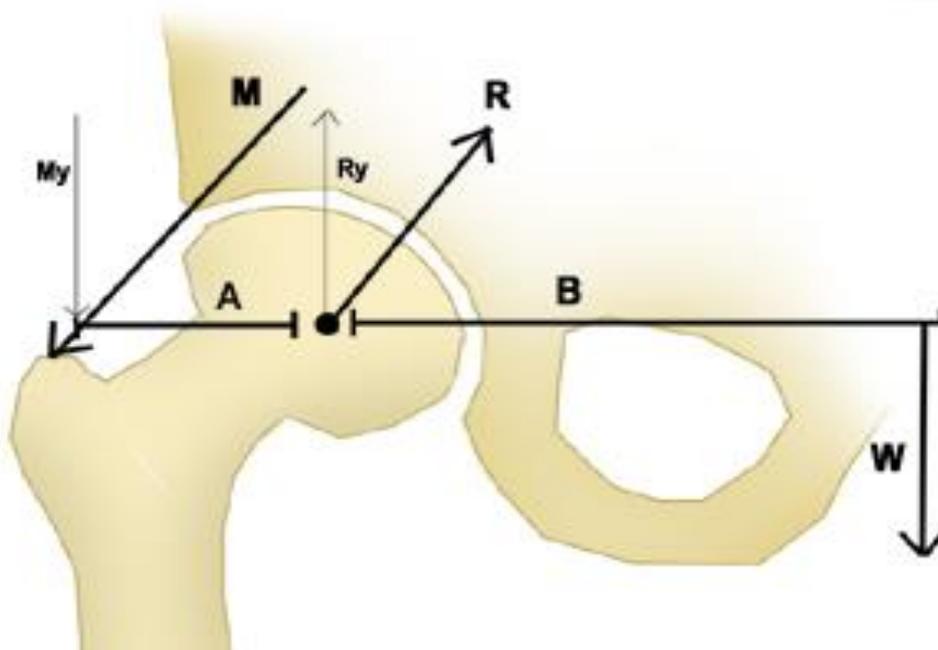
Picture 5- blood vessels that supply the hip joint (1).

2.2. Biomechanics of the hip joint

There are different forces that act in the joint and there is need for the doctor to acknowledge this forces during total hip replacement. Understanding of the hip joint biomechanics is important in progressing diagnosis and treatment of various pathological conditions that affect the joint. Some of the areas that have greatly benefited from hip biomechanics incorporate assessment of hip joint function, advancement of treatment programs for various joint disease, procedures for developing reconstructive hip surgeries and designing of total hip prostheses. The four critical types of forces that are found in the hip joint include joint reaction force, abductor muscle force, gravitational force and hip joint force. Hip joint reaction force is defined as the force that is produced within the hip joint in response to the forces that are acting on it. In the hip, joint reaction force is produced as a consequence of the need to establish balance of moment arms of the body weight and abductor tension. (18)

This force also serves an important purpose of maintaining the level of the pelvis. Abductor muscle force is the force that is created by contraction of abductor muscle. It plays an important role of producing a torque that is necessary for frontal-

plane stability of the pelvis during movement. Gravitational force is the force of gravity that is exerted against the foot and transferred to the femoral condyles through the tibia. (18) The figure below summarizes some of the forces that are experienced in the hip joint.



Picture 6- different forces of the hip joint (13)

In the picture above, W indicates gravitational force while M indicates the abductor muscle force. R indicates joint reaction force.

The degree of the forces indicated above depends entirely on lever arm ratio. Lever arm ratio is determined by considering the proportion of the body mass moment arm and abductor muscle moment. The normal levels for a single leg stance are three times the body weight, which corresponds to a ratio of 2.5. Anything that upsurges the lever arm ratio will automatically upsurge the abductor muscle force that is needed for gait. This on the other hand will increase the force realized at the head of the femur. People who have short femoral necks also record high hip forces while people who have wide pelvis also have larger hip forces. This character is mostly witnessed in women who have larger hip forces considering that their pelvis accommodate the birth canal. This is one of the reasons why women record more hip fractures as compared to men. This also explains why more women have total hip replacements as compared to men. (13)

2.3. Kinesiology of the hip joint

Hip joint kinesiology is another important concept that the doctor must be conversant with during total hip replacement. In specific terms, hip kinesiology is the study of the mechanics of hip movements. In this section, the muscles that are involved in hip extension, hip flexion, hip internal rotation, hip external rotation, hip abduction and hip adduction are identified. (2)

Hip Extension

Gluteus maximus acts as the prime mover during hip extension while biceps femoris, semimembranosus and semitendinosus muscles act as major synergists. Psoas, tensor fascia latae, Sartorius, rectus femoris, pectineus and iliacus act as antagonists. The major stabilizers of hip extension include deep rotators of the hip while gluteus medius muscles act by neutralizing the external rotation of gluteus maximus muscle. The fixators of hip extension include abdominis muscles, erector spinae muscles and obliques. (1, 16)

Hip Flexion

The main prime mover of hip flexion is psoas muscle. Antagonist muscles in this case include biceps femoris, semimembranosus, semitendinosus and gluteus maximus. Synergistic muscles of hip flexion include rectus femoris, iliopsoas, Sartorius and pectineus. Internal and external rotation is prevented by iliacus muscles which work well with psoas muscle in this case. The stabilizers in hip flexion are deep rotators of the hip while fixators comprise of rectus abdominis, erector spinae and obliques (16).

Hip Internal Rotation

The prime movers of hip internal rotation is gluteus minimus. Synergistic muscles of hip internal rotation include biceps femoris, frontal fiber of gluteus medius muscle, semitendinosus, anterior adductors and semimembranosus muscles. Hip internal rotation is neutralized by gluteus maximus and medius. Excessive flexion and adduction is prevented gluteus minimus. Stabilizers in this case include deep rotators of the hip while fixator muscles comprise of erector spinae, obliques and rectus abdominis. (1, 16)

Hip External Rotation

The prime mover of hip external rotation is piriformis (6). Synergistic muscles include deep rotators of hip, biceps femoris, gluteus maximus, Sartorius and adductor magnus. Posterior strands of gluteus medius also act as synergistic muscles. Antagonist muscles include anterior fiber of gluteus minimus and medius, anterior adductor muscles, semitendinosus and semimembranosus muscles. The hip extension rotation is neutralized by various muscles that include hip flexors and anterior adductors that act by reducing the tendency of exterior rotators to over extend and therefore abduct the hip. Stabilizers in this case include gluteus medius and minimus. Deep rotators of the hip also work as stabilizers. The major fixators of hip external rotation include erector spinae, rectus abdominis and obliques. (1, 16)

Hip Abduction

The prime mover of hip abduction is gluteus medius. Synergistic muscles of hip abduction include gluteus minimus and maximus, Sartorius and tensor fascia latae. Antagonist muscles include pectineus, adductor longus, gluteus maximus and adductor magnus muscles. A carefully managed equilibrium of strength and elasticity between internal rotators and external rotators guarantees that there is optimum muscular synergies. Assisting flexion is prevented by different muscles such as rectus femoris, biceps femoris, semimembranosus, psoas and semitendinosus. Deep rotators of hip act as stabilizers while obliques, erector spinae and rectus abdominis act as fixators of hip abduction. (1, 16,22)

Hip Adduction

The prime mover of hip adduction is adductors while synergists include semitendinosus, inferior fibers of gluteus maximus, semimembranosus and quadratus femoris. Antagonistic muscles of Hip adduction include gluteus minimus and medius, Sartorius, fascial slips and tensor fascia latae. Neutralizers of hip adduction include the thigh adductors that facilitate rotation. A well-integrated balance of strength and tractability between internal rotators and external rotators facilitates muscular synergies. Ancillary flexion is prevented various muscles such as rectus femoris, psoas, semitendinosus, rectus femoris and pectineus. Stabilizers in this case include deep rotators of the hip while rectus abdominis, quadratus lumborum and erector spinae act as fixators. (1, 16, 29)

2.4. Polyarthrititis

Polyarthrititis is a term that used to refer to any kind of arthritis that affects five or more joints simultaneously.

2.4.1. Etiology of Polyarthrititis

Polyarthrititis is normally caused by autoimmune diseases and is experienced at any age. It is also not gender specific and therefore affects both men and women. Polyarthrititis is also associated with bilateral edema, which affects the lower limbs causing severe pain and joint swelling. Most of the patients who suffer from polyarthrititis have a history of rheumatoid and psoriatic arthritis, systemic lupus erythematosus and other diseases such as cancers. (1)



Picture 7- polyarthrititis of the hands (27)

2.4.2. Etiopathogenesis of polyarthrititis

Cartilage is a flexible, connective tissue in joints that absorbs the pressure and shock created from movement like running and walking. It also protects the joints and allows for smooth movement. Some forms of arthritis are developed because of reduction of cartilage tissue. For example, osteoarthritis occurs because of natural breakdown of cartilage tissue, which might happen by an injury or infection to the joints.

Another common form of arthritis, rheumatoid arthritis, occurs when body's immune system attacks the tissues of the body. These attacks affect the synovium,

which secretes a fluid that nourishes the cartilage and lubricates the joints. Rheumatoid arthritis can eventually lead to the destruction of both bone and cartilage inside the joint. The exact cause of the immune system's attacks has not yet been discovered. (11, 27)

2.4.3. Clinical picture of polyarthritis

There are different types of symptoms that are observed in patients of polyarthritis.

Pain: patients suffering from polyarthritis complain of pain in multiple joints.

Swelling: the affected joints of the patient become inflamed and swollen. This is mainly caused by accumulation of synovial fluid or intra-articular effusion. Bursitis, which is the inflammation of the bursae, may also occur.

Redness and tenderness: inflamed joints become redness. The joints also develop an abnormal sensitivity to pressure and touch.

Warmth: Polyarthritis patient complains of warmth that is normally felt on the affected joints of the body.

Bogginess of joint: in polyarthritis, lining of the affected joint begins to grow irregularly and therefore give the joint a mushy texture. This mushy sensation is known as boggy and may at times remain even when the patient is not having a flare.

Stiffness and restricted movement: patient suffering from polyarthritis tend to have joint pain when the affected joint is moved. If polyarthritis affects the limbs, the patient is forced to refrain from stretching the limbs to a specific extent due to pain.

Deformation: deformation occurs especially when there is severe polyarthritis. Joints tend to swell and therefore interfering with the normal structure of the body organ in which the joint are affected.

Other symptoms of polyarthritis include extra articular manifestations, which in most cases are comprised of Sjogren's syndrome, visceral nodules in the lungs, pulmonary fibrosis and vasculitis. (11,27)

2.4.4. Diagnosis of polyarthritis

Diagnosis of polyarthritis can be tricky and the clinician needs to ensure that he or she considers the history of the patient in the diagnosis process. Diagnosis of polyarthritis involves a careful consideration of the patient's history, physical assessment and laboratory tests in order to ascertain features that are characteristic to polyarthritis. In medical history, the clinician should identify whether the patient had

earlier suffered from diseases such rheumatoid arthritis, psoritic arthritis or systemic lupus erythematosus. The clinician should then do a physical examination, which will determine if more than five joints of the patient are aching. Physical examination should also investigate whether the aching joints are inflamed, swollen and reddened. The following laboratory tests are then performed in order to rule out other diseases that present same symptoms as polyarthritis.

Antinuclear antibody (ANA) test: if the test is negative, systemic lupus erthromatosus and other rheumatic diseases are eliminated.

Complete blood count (CBC) and urinalysis: CBC is usually abnormal in polyarthritis. Anemia and thrombocytopenia are evident in polyarthritis. Urinalysis helps exclude polyarticular gout which is normally confused with polyarthritis.

Radiography of upper and lower limbs: radiography is done in the initial evaluation for checking disease progression. Patients with polyarthritis may indicate joint erosion in the diseased joints.

Serologic studies: serologic tests help identify viral polyarthritis, which is in most cases caused by parvovirus B19.

Synovial fluid examination: synovial fluid from aching joints is aspirated and analyzed in order to exclude gout and crystalline arthropathy that is experienced in individuals undergoing glucocorticoid doses for symptomatic relieve. (10,26)

2.4.5. Treatment of polyarthritis

Treatment of polyarthritis is mostly dependent on the type of arthritis, age of the patient and severity of symptoms. Treatment of polyarthritis is aimed and alleviating the symptoms and limiting disease progression. Management can be done through medication, occupational therapy and physiotherapy, personal efforts and home remedies. (11, 27)

Medication

There are various drugs that can be administered in polyarthritis. Analgesics should be administered regularly in order to control pain. Nonsteroidal anti-inflammatory drugs can be used to control persistent pain that is accompanied by inflammatory component. Intra-articular steroids can be administered routinely to reduce acute flare ups of arthritis. If the disease has affected the connective tissue, the

doctor can prescribe Disease Modifying Antirheumatic Agents. Immunosuppressant such as Azathioprine and Methotrexate can also be used in treatment of polyarthritis. (11, 27)

Physiotherapy and occupational therapy

Physiotherapy and occupational therapy procedures can be used to manage polyarthritis. Physiotherapy will help the patient reclaim and maintain the normal functions of the joint. Therapeutic exercise methods used to keep full range of motion include joint mobilizations and muscle stretching. Also, isometric exercises need to be performed by the patient several times a day in order to strengthen weak muscles. Gait and posture must be corrected. Occupational therapy on the other hand helps in managing polyarthritis both at home and mobility clinics and improves patient's ability to perform ADL activities. (8,11,27)

Personal efforts and home remedies

Patients suffering from polyarthritis should ensure that they take all measures that help them to reduce weight. Weight loss plays an important role as it helps with symptom control especially in patients who are overweight and therefore have a problem with weight bearing joints. In terms of home remedies, heat may be applied regularly in the aching joints as it helps provide relief in non-inflammatory types of arthritis such as osteoarthritis. Graduated exercise may also help the joints to maintain their function particularly in osteoarthritis. (11,27)

2.5. Coxarthrosis

Coxarthrosis can be defined as a progressive osteoarthritis of the hip joint. It is included on the symptoms of the polyarthritis and it is a chronic illness that is characterized by continuous damage of joint cartilage and therefore limit the mobility of the patient. Diagnosis of coxarthrosis disease is founded on a set of radiographic examinations and clinical symptoms that are presented by the patient. (11,19)

2.5.1. Symptoms of coxarthrosis

The symptoms of coxarthrosis depend on the stage of the disease. These include: Initial stage: in this stage, the patient experiences periodic pains that are concentrated in the hip especially after intense physical activities.

Second stage: the pain increases and spreads to the groin and hip regions. This causes pressure and burning sensation, which limits motion.

Third stage: in this stage, the patient experiences prolonged pains in the hip region. This limits movement and the patient has to use crutches when walking. (12)

2.5.2. Diagnosis of coxarthrosis

Diagnosis of coxarthrosis is based on clinical symptoms and x-ray findings. X-ray findings in patients with coxarthrosis indicate several features such as joint space thinning, presence of osteophytes and cysts and joint malignancy (12).

2.5.3. Treatment of coxarthrosis

Coxarthrosis has got no standard treatment and depends more on the stage of the disease. At the initial phase, medical specialists recommend use traditional medications combined with sedative and anti-rheumatic drugs. When the illness has gone to the second and third phase, the treatment process needs to be changed and progress to surgery. Hip arthroscopy helps eliminate damaged cartilage and replace it with a substitute material base (17).

2.6. Hip arthroplasty, surgical procedure

Partial and total hip replacement are two most commonly used words in surgery. Partial hip replacement occurs when the ball of the femur is removed, and femur bone reamed out in order to accept a prosthetic metal stem that is topped with a ceramic or a metal ball. In most cases of partial surgery, the acetabulum part of the hip joint is left intact while the femur bone is replaced with components that are similar to those of total hip replacement. The most popular form of partial hip replacement is bipolar prosthesis. Total hip replacement on the other hand is a term that is used to define a process in which the diseased bone of the hip and its associated cartilage are surgically replaced with other artificial components of the hip joint. Total hip replacement is done when the hip joint is severely sick and cannot be treated by other means except replacement. Osteoarthritis is one of the main illnesses that facilitate hip replacement. (24)

Osteoarthritis is a disease that affects the protective cartilage that is present at the ends of the bones. The cartilage of the bone wears down facilitating replacement of

the joint. Although osteoarthritis can affect any joint in the body, it is imperative to note that it mainly affects the joints of the vertebral column, hands, hips, and knees. Osteoarthritis is primarily associated with old age, congenital defects of the hip joint and severe trauma. Other conditions that warrant total hip replacement comprise breakage of the hip joint bone, severe rheumatoid arthritis, avascular and aseptic necrosis. In cases of arthritis, partial or total hip replacement is done in order to relieve arthritis pain. (24)

In hip replacement, the doctor first examines the total damage that has been caused by osteoarthritis or any other disease that affects the hip. The level of damage is observed through radiography where the doctor examines the amount of cartilage that has been worn out by the illness. Two types of anesthesia are applied before the process starts. General anesthesia helps the patient to sleep so that he or she does not feel pain while regional or epidural anesthesia keeps the section below the waist numb so that the patient does not feel pain during surgery. The surgeon then makes a surgical incision in order to open up the joint and carry out the replacement process. The cut is made over the buttocks to open up the hip joint. (24)

The surgeon removes the head of the thigh bone and then cleans out the hip socket. The doctor then replaces the components of the hip depending on whether it is a partial or total replacement. In total hip replacement (TEP), the surgeon places the new hip socket in position and then inserts the metal stem into the thigh bone. In some cases, the new parts of the joint are held together with special cement. The muscles and ligaments are then repaired and placed in the new joint after which the surgical wound is closed. In normal circumstances, the hip surgery process takes approximately one to three hours. (31)

2.6.1. Pre-operative physiotherapy

Pre-operative physiotherapy refers to exercises that the patient should engage himself or herself in before the surgery is done. These activities play an important role of preparing the patient for the surgical process. In this case, the patient should rehearse engaging in various activities using a walker, cane, crutches or a wheelchair. This ensures that the hip joint is moved efficiently and therefore prepare the patient. Also,

the patient should be involved in is climbing the stairs and going down the stairs using crutches. Another goal in pre-operative physiotherapy is to correct muscle imbalances in the area of hip joint (by strengthening weak muscles) and decrease contractures. Also, breathing exercises and proprioceptive training (e.g. small foot) should be showed to the patient. By engaging in these activities, the patient ensures that he or she is prepared to use a wheelchair and other forms of assistance like crutches that are likely to be used after the surgery. (9)

2.6.2. Post- operative physiotherapy

Post-operative physiotherapy refers to exercises that the patient who has undergone surgery should be involved in. These exercises promote healing and at the same time ensure that the patient gains his ability to walk after the surgery. Breathing exercises, positioning with pillows between the thighs in order the patient to limit adduction and internal rotation, isometric lower extremity exercises and exercises for thromboembolic prevention are used on the first day after total hip replacement. Also, the post-surgery patient is encouraged to start moving and walking on the second or third day after the surgery. However, the patient should ensure that he or she does not walk for long distances in order to avoid dislocation of the healing hip joint due to fatigue. Fatigue occurs when the post-surgery patient walks for a long distance. Also, patient must walk with decrease weightbearing (20% - 50% of body weight for 6-12 weeks) on the operated leg. It creates stress that is transferred to the hip joint and therefore predisposes the hip joint to dislocation. As the days pass, patient will perform exercises in prone position (for extension and abduction of the hip) and side-lying position with a pillow between the knees. During third week, patient can start train to walk in the stairs. Post-operative physiotherapy helps the patients to recover from trauma of surgery and regain his stability and capacity to walk. (9, 20)

3. SPECIAL PART (CASE STUDY)

3.1. METHODOLOGY:

The clinical work practice was done in Revmatologický ústav in Albertov, Praha. It started on Monday 12th of January 2015 and finished on Friday 23rd of January 2015 (10 days of practice). Each day had duration of 8 hours. The total amount of hours of practice was 80 hours.

My clinical work placement was supervised by Mgr. Maja Špiritovič. The number of sessions with my patient were ten.

The therapeutic procedures were applied in an individual therapy and exercise room. The therapy I used was mostly manual therapy. However, I also used soft balls for soft-tissue techniques, and elastic band, overball and a big ball for strengthening exercises. For the examination I also used instruments such as goniometer, measurement tape and a neurological hammer. Patient was using crutches in all therapeutic sessions.

My work has been approved by the Ethics Committee of the Faculty of Physical Education and Sport at Charles University.

3.2. Anamnesis:

Gender of the examined person: Female

Initials of the examined person: V.M.

Year of birth: 1947, 68 years old

Diagnosis: Polyarthritis with total hip replacement on the right side

Medical Code: M13, M.161

3.2.1. Status Presents:

The patient had operation of total hip replacement on the right hip at 2nd of January 2015 due to coxarthrosis. Patient after 10 days from surgery is in very good mood and as she explained to us she is very happy with the progression of her therapy. She is self-sufficient and she can move using the crutches and walk through the corridor without any help. She didn't try to walk in stairs yet. She told us that immediately after she did the operation on her right hip according to VAS scale she was feeling pain 9/10 when she was performing any movement. Now, she feels pain 4/10 sometimes when she performs exercises for a long time. She doesn't feel pain on the scar. The scar is 18 cm long, with stitches and is covered. There is no edema on the scar or around the thigh, but there is slight edema at the knee. There is also hematoma on the posterior side of the scar around gluteus muscle. Patient wears compression stockings from the metatarsal bones until middle thigh for thromboembolic prevention.

Height: 163 cm

Weight: 63,5 kg

BMI: 23.9

Blood pressure: 117/70

Heart pulse: 71

3.2.2. Personal Anamnesis:

Patient informed us that when she was 54 years old she noticed that her hands were swollen (especially on the left extremity) and she decided to go to the doctor for some examinations. The examinations that were performed to her were X-ray of both hands and ultrasound. After those examinations the doctor said to the patient that on the

3rd finger at PIP joint in the left extremity they found some change because of arthrosis. The patient was diagnosed with polyarthrosis, polyarthralgia and starting arthritis of small joints. The doctor gave medications for therapy to the patient (Sulfasalazin and Condrosulf). From the time she was taking that medication she didn't notice any swollen joints on her hands, but she started to feel pain on both knees and hips. She had operation of total hip replacement on both hip because of coxarthrosis. She also has gonarthrosis and omarthrosis. Now our patient is diagnosed with polyarthrititis after total hip replacement.

First Hospitalization on 11th of April 2014: She had to be hospitalized in Revmatologický ústav for the operation on the left hip (total hip replacement) due to coxarthrosis. Patient followed a programme for rehabilitation after the surgery in order for her left hip to be fully recovered and for her to be able to make ADL activities.

She is also controlled by a doctor because she is anemic, she has hypertension and also lymphocytic thyroiditis.

3.2.3. Family anamnesis: Patient mentioned that her mother had either rheumatoid arthritis or arthrosis but she was not sure. Her father and her children are healthy.

3.2.4. Social anamnesis: She is living alone in a flat at the 1st floor with elevator. Her daughter is living on the same building at the 2nd floor so she will assist her if she needs any help.

3.2.5. Occupational anamnesis: Pensioner.

3.2.6. Gynecological Anamnesis: She had a normal menstruation until 50 years old and was 3 times pregnant. She never had any gynecological disease.

3.2.7. Operation Anamnesis: She had operation for cataract on both eyes approximately 10 years ago, left shoulder synovectomy many years ago and total hip replacement of left hip (11/4/2014).

3.2.8. Pharmacological anamnesis:

On 2001, she was taking Sulfasalazin and Condrosulf for medication in order to decrease the swelling in the small joints but she stopped after a while. Patient used to take Euthyrox, Volnostin, Lokren, Vigantol, Calchichew, and Clexane.

Current medication: Now she is taking Sulfasalazin from 4/01/2015 until 2/04/2015.

3.2.9. Previous rehabilitation:

She had the operation of total hip replacement at 11th of April 2014 on the left hip and she was hospitalized at Revmatolicky Ustav. She had for approximately 3 weeks rehabilitation for the hip and the therapy was focused on mobilization of the joints of the foot and knee, soft tissue techniques, stretching and strengthening exercises and electrotherapy.

Patient also mentioned that when she went out of the hospital, she went to a spa daily after this operation and followed a therapy with water and electrotherapy, which helped her in general arthrosis and also helped her to recover fully from the operation of the left hip.

She also had some therapy for the operation in the shoulder (shoulder synovectomy) that was focused in exercises that increased range of motion and strengthening exercises.

3.2.10. Excerpt from patient's health care file:

Patient has X-ray on the hip joint before the surgery and it showed that a total hip replacement was needed in the right side due to coxarthrosis. Also, she had X-ray of the small joints in the hand before many years.

3.2.11. Indication for rehabilitation:

Doctor indicated physiotherapeutic courses that will be concentrated on the verticalization of the patient – the patient must be able to transfer herself into different positions and walking with crutches with no fear and also breathing exercises that would help the patient to have an upright position when walking. Moreover, soft tissue techniques for the scar, skin and fascia, mobilization of the joints on the foot and knee joint, stretching and strengthening exercises for the muscles surrounding hip.

3.2.12. Subjective feeling of the patient:

She is feeling a little bit painful the area around hip and she mentioned that when she is walking with crutches she has pain around right knee and it's a bit swollen.

3.2.13. Previous Injuries and Trauma:

She had fissure around left ankle 2 years ago, fracture of DIP joint (5th finger) right side 3 years ago.

3.2.14. Allergies:

Pencillin, Ajatin and also allergy in eggs.

3.2.15. Abuses:

She doesn't smoke and doesn't drink alcohol.

3.2.16. Differential balance:

My hypothesis for the patient who had total hip replacement surgery is that her right thigh will have swelling and retracted fascia and superficial layers of skin. Also, I expect some muscle imbalance (some muscles are on hyperactivity and some on inhibition). Gluteus muscles (gluteus maximus, minimus and medius), tensor fascia latae and quadriceps femoris muscle (vastus lateralis, vastus intermedius, vastus medialis) will be hypotonic muscles. Hypertonic muscles will be rectus femoris and adductors of the hip (adductor magnus, adductor longus, adductor brevis, gracilis and pectineus). Moreover, weakness on the muscles around the leg (quadriceps, gluteus muscles, adductors, abductors of the hip and hamstrings). There must be a limited range of motion in hip and knee joint and shortened muscles might be present (gastrocnemius, soleus, adductors and flexors of the hip). It is possible that restricted joints will be found (Lisfranc's joint, Chopart's joint, Talocrural joint, Metatarsophalangeal joints, Interphalangeal joints and patella) and wrong stereotype of hip abduction and hip extension. During standing and sitting, most probably patient will have a forward position of the body (forward shoulders, head) and also during walking, instability may be present. Patient might be able to be self-sufficient and walk independently (there might be overuse of upper extremity) and might use the 3- point alternate gait with crutches during walking. Breathing might be wrong (e.g. inactivation of abdominal muscles).

3.3. Initial Kinesiologic Examination:

- Observation
- Postural examination
- Gait examination
- Breathing examination

- Anthropometric measurements
- Soft tissue examination by Lewit
- Muscle tone examination (palpation)
- Muscle strength test
- Muscle length test by Janda
- Examination of movement patterns by Janda
- ROM examination by Kendall
- Joint play examination by Lewit
- Neurological examination

3.3.1. Observation:

- Slight swelling on the anterior and lateral part of the right thigh and area around the knee is slightly swollen.
- The scar is on the lateral part of the right thigh and it is 18 cm long with stitches and is covered with a white material above. There is also a scar on the lateral part of the left thigh from the previous total hip replacement surgery but that one is healed.
- There is no redness around the scar and there is a hematoma on the posterior right thigh on the gluteus muscle.

3.3.2. Postural examination:

Posterior view:

- Narrow base of support.
- Left feet slightly in external rotation.
- Slight valgosity of both ankles (more on the right side).
- Slight valgosity of both knees (more on the right side).
- Popliteal fossas are on the same level.
- Right subgluteal line is higher than left one.
- Left posterior iliac spine is lower than right posterior iliac spine.
- Left anterior iliac spine is also lower than right anterior iliac spine.
- Right iliac crest is higher than left iliac crest.
- Patient has scoliosis at thoracic part of the spine starting from Th8 (going to the right side).
- Scapulas are on the same level.

- Not winged scapulas.
- Left shoulder is higher than the left one.
- Head is slightly rotated to the left side.

Lateral view from the right side:

- Right knee is slightly semiflexed.
- Slight posterior tilt of pelvis.
- Thoracolumbar part of the spine is kyphotic starting from L3 and ending on Th4.
- Cervical part of the spine is flat.
- Shoulders are slightly forward because of the crutches.
- Head is slightly forward.

Lateral view from the left side:

- Left knee is slightly extended.
- Slight posterior tilt of pelvis.
- Thoracolumbar part of the spine is kyphotic starting from L3 and ending on Th4.
- Cervical part of the spine is flat.
- Shoulders are slightly forward because of the crutches.
- Head is slightly forward.

Anterior view:

- Feet are not flat, there is more space on her left feet.
- Slight valgosity of both ankles.
- Slight valgosity of both knees.
- Left thoracobrachial triangle is slightly bigger than the right one.
- Internal rotation of the patellas in both sides.
- Hypotonic abdominal muscles.
- Left shoulder is slightly elevated.
- Head is slightly rotated to the left side.

* Other examinations such as modification of stance and two-scale test were not performed due to the reason that the patient was using crutches and it was not possible. Moreover, I didn't perform dynamic spine examination, but I should have performed it in sitting position.

3.3.3. Gait examination:

The patient is walking with underarm crutches and she is using the 3- point alternate gait.

- Small base of support.
- She has non-periodic walking rhythm.
- She has a slow walking speed due to the reason that she is still a little bit scared.
- She walks with short steps but they are not all steps in the same length.
- When she steps on a foot, she steps in both sides with the whole foot on the floor on both sides. During walking, she loads her foot with flat foot.
- With the left leg sometimes she is doing external rotation.
- Valgosity of the knees.
- Forward bending of the trunk during walking.
- No movement of the head.
- She is stable when walking.

Patient during walking with crutches she is using around 20 % loading with the operated leg.

3.3.4. Breathing examination:

Patient for breathing examination she was lying in supine position with extended knees.

- Patient doesn't use lower abdominals for breathing.
- Mobilization of the thorax is good.

3.3.5. Anthropometric measurements:

Lower Extremities	Left	Right
Functional length ASIS	89 cm	89 cm
Functional length (umbilicus)	96 cm	96 cm
Anatomical length	89 cm	89 cm

Table 1- Anthropometric measurements for length of lower extremities.

Lower Extremities	Left	Right
Thigh (15 cm above knee)	45 cm	46 cm
Thigh (10 cm above knee)	39 cm	41 cm
Knee	36 cm	38 cm
Calf	31 cm	32 cm
Ankle	31 cm	31 cm
Foot	23 cm	23 cm

Table 2- Anthropometric measurements for circumferences of lower extremities.

3.3.6. Soft tissue examination by Lewit:

- Examination of fascia of lower extremities: Restricted fascia on the right hip on the medial and anterior part on cranial and caudal direction. Examination of the fascia in the lateral part was not performed due to the reason that the scar has stitches now. Also, fascia of calf is slightly restricted in medial direction.
- Superficial layers of skin: No restriction on the posterior part of the thigh. On the anterior, lateral and medial part of the thigh there is restriction of the skin on caudal, cranial, medial and lateral direction.
- Scar: Scar was not examined due to the reason that the scar is covered and also there are stitches.

3.3.7. Muscle tone examination (Palpation):

Tested muscle	Left	Right
Quadriceps Femoris muscle (rectus femoris, vastus medialis, vastus intermedius, vastus lateralis)	Hypertonic	Hypertonic ++
Gluteal muscles (Gluteus medius, Gluteus maximus)	Hypotonic	Hypotonic
Hamstrings	Normal	Normal
Adductors (Adductor magnus, brevis, longus, gracilis, pectineus)	Normal	Hypertonic +
Iliopsoas muscle	Normal	Normal
Tensor fasciae latae	Normal	Normal
Erector spinae	Normal	Normal
Quadratus lumborum	Normal	Hypertonic +

Table 3- Muscle tone examination

3.3.8. Muscle strength test according Kendall:

Lower extremity muscles:

Tested muscle	Left	Right
Quadriceps femoris	4	3
Gluteus minimus and maximus	4	3
Hamstrings	4	3+
Hip abductors (gluteus maximus and tensor fascia latae)	4	3
Adductors	4	3
Ankle dorsal flexors	4+	4
Ankle plantar flexors	4+	4

Table 4- Muscle strength examination by Kendall

3.3.9. Muscle length test by Janda:

Examined muscle	Left	Right
Gastrocnemius	0	0
Soleus	0	0
Adductors of the hip	0	2
Paravertebral muscles	0	0

- Length test of hip flexors and hip extensors was not examined because patient didn't feel so comfortable with the position.

Table 5- Muscle length examination by Janda

3.3.10. Examination of movement patterns by Janda:

Type of pattern	Left	Right
Hip abduction	Normal	Tensor mechanism
Hip extension	Normal	Hamstrings and erector spinae are activated whereas the gluteus maximus contraction is decreased

Table 6- Examination of movement patterns by Janda

3.3.11. ROM examination by Kendall (SFTR form):

*ROM was made using a plastic goniometer.

Lower extremity:

HIP JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	5° – 0° – 90°	10° – 0° – 90°	0° – 0° – 70°	5° – 0° – 80°
F	20° – 0° – 0°	25° – 0° – 0°	10° – 0° – *0°	15° – 0° – *0°
Rs	20° – 0° – 20°	20° – 0° – 20°	*0° – 0° – *0°	*0° – 0° – *0°

* Adduction, internal and external rotation are contraindicated after total hip replacement surgery. Flexion of the hips were performed with flexed knees.

Table 7- R.O.M. (hip joint) by Kendall

KNEE JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	0° – 0° – 110°	0° – 0° – 115°	0° – 0° – 90°	0° – 0° – 100°

Table 8- R.O.M. (knee joint) by Kendall

ANKLE JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	30° – 0 – 20°	35° – 0 – 20°	30° – 0 – 20°	35° – 0 – 20°
Rs	25° – 0 – 30°	25° – 0 – 30°	25° – 0 – 30°	25° – 0 – 30°

Table 9- R.O.M. (ankle joint) by Kendall

Upper extremity:

SHOULDER JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	$45^{\circ} - 0^{\circ} - 175^{\circ}$	$45^{\circ} - 0^{\circ} - 180^{\circ}$	$45^{\circ} - 0^{\circ} - 180^{\circ}$	$45^{\circ} - 0^{\circ} - 180^{\circ}$
F	$0^{\circ} - 0^{\circ} - 180^{\circ}$			
T	$40^{\circ} - 0^{\circ} - 90^{\circ}$			
R	$90^{\circ} - 0^{\circ} - 70^{\circ}$			

Table 10- R.O.M. (shoulder joint) by Kendall

ELBOW JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	$0^{\circ} - 0^{\circ} - 145^{\circ}$			

Table 11- R.O.M. (elbow joint) by Kendall

RADIOULNAR JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
R _s	$90^{\circ} - 0^{\circ} - 90^{\circ}$			

Table 12- R.O.M. (radioulnar joint) by Kendall

WRIST JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	80° – 0° – 70°	80° – 0° – 70°	80° – 0° – 70°	80° – 0° – 70°
F	20° – 0° – 35°	20° – 0° – 35°	20° – 0° – 35°	20° – 0° – 35°

Table 13- R.O.M. (wrist joint) by Kendall

METACARPOPHALANGEAL JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	0° – 0° – 90°	0° – 0° – 90°	0° – 0° – 90°	0° – 0° – 90°
F	20° – 0° – 20°	20° – 0° – 20°	20° – 0° – 20°	20° – 0° – 20°

* These results are the same for all the fingers.

Table 14- R.O.M. (MCP joint of 2-5 fingers) by Kendall

INTERPHALANGEAL JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	0° – 0° – 100°	0° – 0° – 100°	0° – 0° – 100°	0° – 0° – 100°
S	0° – 0° – 80°	0° – 0° – 80°	0° – 0° – 80°	0° – 0° – 80°

* First results are for the proximal interphalangeal joints of the fingers and the second ones are for distal interphalangeal joints of the fingers. These results are the same for all the fingers (2-5 fingers).

Table 15- R.O.M. (IP joint of 2-5 fingers) by Kendall

3.3.12. Joint play examination by Lewit:

Joint	Left	Right
Patella (medial, lateral, cranial and caudal directions)	Not Restricted	Restricted in all directions
Tibiofibular joint in dorsal and ventral directions	Not Restricted	Restricted in all directions
Talocrural joint in dorsal and ventral directions	Not Restricted	Restricted in all directions
Lisfranc's joint in dorsal and ventral directions	Not Restricted	Restricted in all directions
Chopart's joint in dorsal and ventral directions	Not Restricted	Restricted in all directions
Metatarsophalangeal joints in plantar, dorsal and lateral directions	Not Restricted	Restricted in all directions (mostly in plantar and dorsal directions)
Interphalangeal joints in plantar, dorsal and lateral directions	Not Restricted	Restricted in all directions (mostly in lateral direction on the right side)

Table 16- Joint play examination by Lewit

3.3.13. Neurological examination:

Superficial sensation was examined by touching the skin of the patient on the specific dermatomes on both lower extremities and the feeling of the patient was evaluated:

	Left	Right
Dermatome of L1 segment	Normal sensation	Normal sensation
Dermatome of L2 segment	Normal sensation	Normal sensation
Dermatome of L3 segment	Normal sensation	Normal sensation
Dermatome of L4 segment	Normal sensation	Normal sensation
Dermatome of L5 segment	Normal sensation	Normal sensation
Dermatome of S1 segment	Normal sensation	Normal sensation
Dermatome of S2 segment	Normal sensation	Normal sensation

Table 17- Neurological examination- dermatomes examination

Deep tendon reflexes:

	Left	Right
Knee reflex	3	3
Achilles tendon reflex/ Medioplantar	3	3

Table 18- Neurological examination- deep tendon reflexes

*Evaluation grades, according to Vele, where grade 3 it is consider a normal grade

3.3.14. Conclusion of examination:

Concluding from all those examinations, patient is in a good condition. Ten days after the operation on the right hip she doesn't face any pain during walking or when she is lying in supine position and doing nothing. She only feels pain after she exercises her operated leg. She is self-sufficient, able to walk alone and she did not have any pain when we asked her to perform some movements on the hip and knee joint. Also, she doesn't feel so much pain on the hip as she was feeling on the first days after the operation and she doesn't feel any pain on the scar. Therefore, there is a bit swelling on the area of the right thigh and knee (mostly around patella). Moreover, there is restricted fascia around the thigh and knee and also restricted skin on the anterior, lateral and medial part on caudal, cranial, medial and lateral direction. From the palpation on the muscles, I noticed that gluteus maximus and gluteus medius muscles are hypotonic and also that quadriceps femoris (rectus femoris, vastus medialis, vastus intermedius, vastus lateralis), adductors of the hip (adductor magnus, adductor longus, adductor brevis, gracilis, pectineus) and quadratus lumborum are hypertonic muscles (she felt insertions and origins a little bit painful when palpated). The ROM is limited in movements of Flexion, extension and abduction of hip joint and in knee flexion and extension (mostly in the right leg). I also checked the ROM of the upper extremity to see if it is limited due to polyarthritis but all ROM are physiological. The strength test of the muscles around the leg showed that they are quite weak mostly on the right side or maybe it's the reflex of the hypotonicity of the muscles. The joint play of tibiofibular, talocrural, lisfranc's, chopart's joints, metatarsophalangeal and interphalangeal joints, and patella are restricted in all directions. When i examined the length test of the muscles around the leg, i saw that adductors of the hip are shortened. Patient is able to do abduction and extension of hip but she has wrong movement pattern. All neurological examination was normal. During breathing examination i saw that she doesn't use her lower

abdominals for breathing. Lastly, patient is able to walk through the corridor with crutches but she did not try yet to walk on stairs.

3.4. Short-term and long-term rehabilitation plan

3.4.1. Short-term rehabilitation plan:

- Thromboembolic prevention
- Decrease swelling (edema)
- When the stitches are removed from the scar, improve the mobility of the scar.
- Improve mobility of fascias on the right thigh and calf and also mobility of the skin.
- Mobilization of the restricted joints (tibiofibular, talocrural, MTP, IP) and patella.
- Increase ROM in hip and knee joint.
- Relax hypertonic muscles.
- Stretch shortened muscles.
- Strengthen weak muscles.
- Improve movement pattern of hip abduction and hip extension.
- Improve walking in corridor and try to walk in stairs.
- Correction of ADL.
- Improve stability.
- Improve breathing pattern.
- Correction of wrong stereotypes during sitting and standing.

3.4.2. Long-term rehabilitation plan:

- Regain maximum possible ROM in hip and knee joint and as much as possible strength on the muscles around hip.
- Improve walking pattern and confidence.
- Exercise balance and proprioception.
- Patient must be able to perform ADL activities without any help.

3.5. Therapy Progress

Date: Monday 12/01/2015

Today's present state:

- Today is the 10th day after the surgery.
- The patient mood is good.
- No pain when lying, when she is performing movements of the joints pain level is 4/10. She also said that she feels uncomfortable when changing positions even though she can perform it very easily and she also used a pillow every time she was changing from one position to another.

Goals of today's therapy:

- Thromboembolic prevention.
- Decrease swelling on the right thigh.
- Improve the mobility of fascia and skin on the right thigh and calf.
- Mobilization of the restricted joints in all directions.
- Relax hypertonic muscles.
- Stretch shortened muscles.
- Increase ROM in both lower extremities where is limited (mostly in hip and knee in right side).
- Strengthening weak muscles of both legs.
- Walking through the corridor in a right way.

Procedure:

- For thromboembolic prevention, we showed to our patient exercises in supine position. Active plantar and dorsal flexion of the ankle and circular movements of the foot were performed by the patient (20 times).
- Afterwards I use lymphatic massage with a soft ball, pushing and turning to the right and left side of the thigh. From caudocranial or craniocaudal direction with small ball i did circles in order to reduce swelling.
- Soft tissue technique in latero-lateral direction according to Lewit in ventral part of right thigh fascia, patient in supine position with extended knee. Also, soft tissue technique in latero-lateral direction according Lewit in dorsal part of right calf fascia, patient in supine position with the knee in flexion.
- Mobilization of restricted joints according Lewit:

1. On right patella in all directions (lateral, medial, caudal and cranial) in supine position with extended knee.
 2. Talocrural joint in ventral and dorsal direction on the right leg in supine position with the knee in flexion.
 3. Mobilization of Lisfranc and Chopart joints in all directions on the right leg in supine position with extended knee.
 4. Mobilization of metatarsophalangeal and interphalangeal joints in all directions on the right leg in supine position with extended knee.
- PIR to relax hypertonic muscles on the right side: hip adductors, quadriceps femoris and quadratus lumborum according Lewit in supine position.
 - Stretching of shortened muscles by passive stretching: adductors of the right hip.
 - Passive movements of right hip in direction of flexion 80°, abduction 15° and extension 5° (3 sets, 15 times) and knee in direction of flexion and extension (3 sets, 15 times) in supine position.
 - Active movements in order to increase ROM in the hip and knee joint in supine position.
 1. Flexion and extension of the knee under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 2. Flexion and extension using overball under the heel under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 3. Abduction of the hip, no gravitation, 2nd degree of muscle strength test (3 sets, 10 times).
 - Strengthening exercises for the muscles around hip:
 1. In supine position isometric exercises for strengthening quadriceps femoris (3 sets, 10 times).
 2. Another exercise in supine position for strengthening quadriceps femoris was provided by using overball under right knee and the patient pushed down the knee to the ball and she also performed dorsal flexion of the foot (3 sets, 10 times).
 3. In supine position with flexed knees for strengthening adductors of the hip: I placed an overball between patient's knees and she tried to push the ball (3 sets, 10 times).

4. In supine position with knees flexed for strengthening gluteal muscles, patient provided active elevation of pelvis (3 sets, 10 times).
5. In order for the patient to change position and turn from supine into prone position, I placed a pillow between her legs and with my help she turned into prone. Patient in prone position performed isometric contractions for strengthening gluteal muscles (3 sets, 10 times).
6. Lastly, for today we instructed our patient to try to be in upright position as much as possible when walking.

Results:

Patient after we finished first therapy she told us that she was very tired but she didn't have any pain around hip joint or scar. I was happy to see that she could change position from supine to prone easily and walk without any difficulty but she was doing them slowly. The only thing she kept doing wrong was her posture during walking. She was doing great with the exercises I showed to her and followed my instructions. At the end of the therapy I noticed a slight increase in ROM in right knee joint of 105° in flexion (passive movement).

Self-therapy:

We told to the patient to try to correct her body position when walking and also provide the exercises for thromboembolic prevention.

Date: Tuesday 13/01/2015**Today's present state:**

- Today is the 11th day after the surgery.
- The patient mood is better.
- Pain level 4/10.
- There still swelling on the right thigh but its less on the area around the patella. Measuring the circumference, the right patella was 37 cm and the left patella 36 cm.
- ROM increased in knee flexion of 105° in passive knee flexion.
- Quadratus lumborum is less hypertonic compared to the first therapy.

Goals of today's therapy:

- Thromboembolic prevention.
- Decrease swelling on the right thigh.
- Improve the mobility of fascia and skin on the right thigh and calf.
- Mobilization of the restricted joints in all directions.
- Reduce tension of hypertonic muscles.
- Stretch shortened muscles.
- Increase ROM in both lower extremities where is limited (mostly in hip and knee in right side).
- Strengthening weak muscles of both legs.
- Walking through the corridor.

Procedure:

- For thromboembolic prevention: active plantar and dorsal flexion of the right and left ankles and circular movements of the foot were performed by the patient.
- Afterwards using lymphatic massage with a soft ball, pushing and turning to the right and left side of the thigh. From caudocranial or craniocaudal direction with small ball i did circles in order to reduce swelling.
- Soft tissue technique in latero-lateral direction according to Lewit in ventral part of right thigh fascia, patient in supine position with extended knee. Also, soft tissue technique in latero-lateral direction according Lewit in dorsal part of right calf fascia, patient in supine position with the knee in flexion.
- Mobilization of restricted joints according Lewit:
 1. On right patella in all directions (lateral, medial, caudal and cranial) in supine position with extended knee.
 2. Talocrural joint in ventral and dorsal direction on the right leg in supine position with the knee in flexion.
 3. Mobilization of Lisfranc and Chopart joints in all directions on the right leg in supine position with extended knee.
 4. Mobilization of metatarsophalangeal and interphalangeal joints in all directions on the right leg in supine position with extended knee.
- PIR to relax hypertonic muscles on the right side: hip adductors, quadriceps femoris and quadratus lumborum according Lewit in supine position.

- In supine position, stretching of shortened muscles by passive stretching: adductors of the right hip.
- Passive movements of hip in direction of flexion, abduction and extension (3 sets, 15 times) and of knee in direction of flexion and extension (3 sets, 15 times).
- Active movements in order to increase ROM in the hip and knee joint.
 1. Flexion and extension of the knee under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 2. Flexion and extension using overball under the heel under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 3. Abduction of the hip, no gravitation, 2nd degree of muscle strength test (3 sets, 10 times).
- Strengthening exercises for the muscles around hip:
 1. In supine position, isometric exercises for strengthening quadriceps femoris (3 sets, 10 times).
 2. Another exercise in supine position, for strengthening quadriceps femoris was provided by using overball under right knee and the patient pushed down the knee to the ball and he also performed dorsal flexion of the foot (3 sets, 10 times).
 3. For strengthening adductors of the hip in supine position: I placed an overball between patient's knees and she tried to push the ball (3 sets, 10 times).
 4. For strengthening both adductors and of the hip and quadriceps femoris I placed an overball between patient's knees and she tried to push the ball and at the same time she was trying to straighten one leg with dorsal flexion.
 5. In supine position with flexed knees for strengthening gluteal muscles, patient provided active elevation of pelvis (3 sets, 10 times).
 6. Patient in prone position performed isometric contractions for strengthening gluteal muscles (3 sets, 10 times).
 7. Also, another exercise for strengthening gluteal muscles in prone position while she was with flexed knees, we placed overball between her feet and i asked her to push her feet and try to elevate her thigh and contract her gluteal muscles (3 sets, 10 times).
- Walking through the corridor.

Results:

Today patient was not so tired as the previous day. I saw an improvement slightly on ROM in flexion in knee joint (she could do actively 95° and passively 105°) and abduction in hip joint (20° passive movement). Even though she told us that she feels more comfortable when bending forward during walking, she managed today to keep herself in upright position and walk with confidence.

Self-therapy:

We instructed patient to perform on the bed thromboembolic exercises and ROM exercises we told her today.

Date: Wednesday 14/01/2015**Today's present state:**

- Today is the 12th day after the surgery.
- The patient mood is very good.
- Pain level 4/10.
- Observation of the right thigh and knee: the swelling starts to decrease. Measuring the circumference, the right patella was 37 cm and the left patella 36 cm, measuring the quadriceps (10 cm above the knee) was 45 cm on both sides and on 15 cm above knee, it was 40 cm on the right side and 39 on the left side. So, the swelling is improved a lot.
- Mobility of the right fascia of thigh and knee according Lewit in latero-lateral direction is better in medial and anterior part on cranial direction.
- Examination of restricted joints on the right side according Lewit: Metatarsophalangeal joints and interphalangeal joints of the fingers are not restricted.
- ROM in hip (flexion, abduction, extension), knee (flexion and extension): ROM in flexion in knee joint (she could do actively 95° and passively 105°) and abduction in hip joint (20° passive movement).

Goals of today's therapy:

- Thromboembolic prevention.
- Reduce swelling on the right thigh.
- Improve the mobility of fascia and skin on the right thigh and calf.
- Joint play of the restricted joints in all directions.
- Relax hypertonic muscles.
- Stretch shortened muscles.
- Increase ROM in both lower extremities where is limited (mostly in hip and knee in right side).
- Strengthening weak muscles of both legs.
- Walking through the corridor.
- Walk up and down the stairs.

Procedure:

- For thromboembolic prevention, active plantar and dorsal flexion of the ankle and circular movements of the foot were performed by the patient.
- Afterwards using lymphatic massage with a soft ball, pushing and turning to the right and left side of the thigh. From caudocranial or craniocaudal direction with small ball i did circles in order to reduce swelling.
- Soft tissue technique in latero-lateral direction according to Lewit in ventral part of right thigh fascia, patient in supine position with extended knee. Also, soft tissue technique in latero-lateral direction according Lewit in dorsal part of right calf fascia, patient in supine position with the knee in flexion.
- Mobilization of restricted joints according Lewit:
 1. On right patella in all directions (lateral, medial, caudal and cranial) in supine position with extended knee.
 2. Talocrural joint in ventral and dorsal direction on the right leg in supine position with the knee in flexion.
 3. Mobilization of Lisfranc and Chopart joints in all directions on the right leg in supine position with extended knee.
- PIR to relax hypertonic muscles on the right side: hip adductors, quadriceps femoris and quadratus lumborum according Lewit in supine position.
- In supine position, stretching of shortened muscles by passive stretching: adductors of the right hip.

- Passive movements of hip in direction of flexion, abduction and extension (3 sets, 15 times) and of knee in direction of flexion and extension (3 sets, 15 times).
- Active movements in order to increase ROM in the hip and knee joint.
 1. Flexion and extension of the knee under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 2. Flexion and extension using overball under the heel under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 3. Abduction of the hip, no gravitation, 2nd degree of muscle strength test (3 sets, 10 times).
- Strengthening exercises for the muscles around hip:
 1. In supine position, Isometric exercises for strengthening quadriceps femoris (3 sets, 10 times).
 2. In supine position, for strengthening quadriceps femoris was provided by using overball under right knee and the patient pushed down the knee to the ball and he also performed dorsal flexion of the foot (3 sets, 10 times).
 3. For strengthening adductors of the hip: I placed an overball between patient's knees and she tried to push the ball (3 sets, 10 times).
 4. For strengthening both adductors and of the hip and quadriceps femoris I placed an overball between patient's knees and she tried to push the ball and at the same time she was trying to straighten one leg with dorsal flexion (3 sets, 10 times).
 5. For strengthening gluteal muscles, patient provided active elevation of pelvis (3 sets, 10 times).
 6. For strengthening both gluteal muscles and adductors of the hip, I placed an overball between patient's knees and she tried to push the ball and at the same time she elevated her pelvis (3 sets, 10 times).
 7. Patient in prone position performed isometric contractions for strengthening gluteal muscles (3 sets, 10 times).
 8. For strengthening gluteal muscles in prone position while she was with flexed knees, we placed overball between her feet and we asked her to push her feet and try to elevate her thigh and contract her gluteal muscles (3 sets, 10 times).
- Walking through the corridor.

- Lastly, today i tried for the first time with the patient to walk up and down the stairs. I instructed patient that when walking upstairs she must use first the healthy leg, then the operated leg and afterwards the crutches. When walking downstairs, she must use first the crutches, then the operated leg and for last the healthy leg.

Results:

Patient felt a little bit tired after we finish with the exercises but she cooperated with me and perform the exercises really good. I could see improvement in ROM of hip flexion with flexed knee (75° active and 80° passive) and extension of hip joint (5° both active and passive) and knee flexion (105° both active and passive). Also, fascia of the right calf was not restricted. At the start when we tried to walk in stairs she was a bit confused about which leg she must use first and last but after some time she got used to it.

Self-therapy:

Patient must try to do all the thromboembolic exercises and ROM exercises in bed.

Date: Thursday 15/01/2015

Today's present state:

- Today is the 13th day after the surgery.
- The patient mood is good.
- Pain level 3/10.
- Observation of the right thigh and knee: there was no swelling on the right thigh and knee. Measuring the circumference, the right patella was 36 cm and the left patella 36 cm, measuring the quadriceps (10 cm above the knee) was 45 cm on both sides and on 15 cm above knee, it was 39 cm on both sides.
- Mobility of the right fascia of thigh and knee according Lewit in latero-lateral direction is better in medial and anterior part on cranial direction and caudal direction. Fascia of calf is not restricted.
- Mobilization of restricted joints on the right side according Lewit: All joints in the right foot are not restricted.

- ROM in hip (flexion, abduction, extension), knee (flexion and extension): hip flexion with flexed knee (75° active and 80° passive) and extension of hip joint (5° both active and passive) and knee flexion (105° both active and passive).
- Evaluation of strength test for quadriceps muscles is 3 +.

Goals of today's therapy:

- Thromboembolic prevention.
- Improve the mobility of fascia and skin on the right thigh and calf.
- Joint play of the restricted joints in all directions.
- Relax hypertonic muscles.
- Stretch shortened muscles.
- Increase ROM in both lower extremities where is limited (mostly in hip and knee in right side).
- Strengthening weak muscles of both legs.
- Walking through the corridor.
- Walk up and down the stairs.

Procedure:

- For thromboembolic prevention: Active plantar and dorsal flexion of the ankle and circular movements of the foot were performed by the patient.
- Soft tissue technique in latero-lateral direction according to Lewit in ventral part of right thigh fascia, patient in supine position with extended knee.
- PIR to relax hypertonic muscles on the right side: hip adductors, quadriceps femoris and quadratus lumborum according Lewit in supine position.
- In supine position, stretching of shortened muscles by passive stretching: adductors of the right hip.
- Passive movements of hip in direction of flexion, abduction and extension (3 sets, 15 times) and of knee in direction of flexion and extension (3 sets, 15 times).
- Active movements in order to increase ROM in the hip and knee joint.
 1. Flexion and extension of the knee under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 2. Flexion and extension using overball under the heel under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).

3. Abduction of the hip, no gravitation, 2nd degree of muscle strength test (3 sets, 10 times).
- Strengthening exercises for the muscles around hip:
 1. In supine position isometric exercises for strengthening quadriceps femoris (3 sets, 10 times).
 2. In supine position, another exercise for strengthening quadriceps femoris was provided by using overball under right knee and the patient pushed down the knee to the ball and he also performed dorsal flexion of the foot (3 sets, 10 times).
 3. For strengthening adductors of the hip: I placed an overball between patient's knees and she tried to push the ball (3 sets, 10 times).
 4. In supine position, for strengthening both adductors and of the hip and quadriceps femoris I placed an overball between patient's knees and she tried to push the ball and at the same time she was trying to straighten one leg with dorsal flexion (3 sets, 10 times).
 5. In supine position, for strengthening gluteal muscles, patient provided active elevation of pelvis (3 sets, 10 times).
 6. In supine position, for strengthening both gluteal muscles and adductors of the hip, I placed an overball between patient's knees and she tried to push the ball and at the same time she elevated her pelvis (3 sets, 10 times).
 7. In supine position with extended knees, I placed an elastic band over the patient's ankles and I asked her to provide abduction first of the right thigh and then of the left one (3 sets, 10 times).
 8. Patient in prone position performed isometric contractions for strengthening gluteal muscles (3 sets, 10 times).
 9. For strengthening gluteal muscles in prone position while she was with flexed knees, I placed overball between her feet and we asked her to push her feet and try to elevate her thigh and contract her gluteal muscles (3 sets, 10 times).
 - I instructed our patient to try to be in upright position as much as possible when walking.
 - Walking with the patient up and down the stairs.

Results:

I saw that patient could perform hip abduction and hip extension in a right movement pattern now and without help.

Self-therapy:

Patient must try to do all the strengthening exercises and ROM exercises in bed and also try to walk through the corridor in order to feel more confident and walk with bigger steps.

Date: Friday 16/01/2015

Today's present state:

- Today is the 14th day after the surgery.
- The patient mood is good.
- Pain level 3/10.
- ROM in hip (flexion, abduction, extension), knee (flexion and extension): No improvement in ROM from the last therapy session.
- Muscle tone examination: Improvement in quadriceps femoris, adductors of the hip (less hypertonic) and quadratus lumborum is not hypertonic.
- Patient performs normal movement pattern of hip extension and abduction.

Goals of today's therapy:

- Thromboembolic prevention.
- Improve the mobility of fascia and skin on the right thigh.
- Relax hypertonic muscles.
- Stretch shortened muscles.
- Increase ROM in both lower extremities where is limited (mostly in hip and knee in right side).
- Strengthening hypotonic muscles.
- Walking through the corridor.
- Walk up and down the stairs.

Procedure:

- For thromboembolic prevention, we showed to our patient exercises in supine position. Active plantar and dorsal flexion of the ankle and circular movements of the foot were performed by the patient.
- Soft tissue technique in latero-lateral direction according to Lewit in ventral part of right thigh fascia, patient in supine position with extended knee.
- PIR to relax hypertonic muscles on the right side: hip adductors, quadriceps femoris according Lewit in supine position.
- In supine position, stretching of shortened muscles by passive stretching: adductors of the right hip.
- Passive movements of hip in direction of flexion, abduction and extension (3 sets, 15 times) and of knee in direction of flexion and extension (3 sets, 15 times).
- Active movements in order to increase ROM in the hip and knee joint.
 1. Flexion and extension of the knee under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 2. Flexion and extension using overball under the heel under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 3. Abduction of the hip, no gravitation, 2nd degree of muscle strength test (3 sets, 10 times).
- Strengthening exercises for the muscles around hip:
 1. In supine position isometric exercises for strengthening quadriceps femoris (3 sets, 10 times).
 2. In supine position, another exercise for strengthening quadriceps femoris was provided by using overball under right knee and the patient pushed down the knee to the ball and he also performed dorsal flexion of the foot (3 sets, 10 times).
 3. For strengthening adductors of the hip in supine position with flexed knees: I placed an overball between patient's knees and she tried to push the ball (3 sets, 10 times).
 4. In supine position, for strengthening both adductors and of the hip and quadriceps femoris I placed an overball between patient's knees and she tried to

push the ball and at the same time she was trying to straighten one leg with dorsal flexion (3 sets, 10 times).

5. For strengthening gluteal muscles in supine position, patient provided active elevation of pelvis (3 sets, 10 times).

6. For strengthening both gluteal muscles and adductors of the hip, I placed an overball between patient's knees and she tried to push the ball and at the same time she elevated her pelvis (3 sets, 10 times).

7. In supine position with extended knees, I placed an elastic band over the patient's ankles and I asked her to provide abduction first of the right thigh and then of the left one (3 sets, 10 times).

8. Patient in prone position performed isometric contractions for strengthening gluteal muscles (3 sets, 10 times).

9. For strengthening gluteal muscles in prone position while she was with flexed knees, I placed overball between her feet and we asked her to push her feet and try to elevate her thigh and contract her gluteal muscles (3 sets, 10 times).

- I instructed patient to try to be in upright position as much as possible when walking.

- I walked with our patient up and down the stairs.

Results:

Today was the 5th day I saw patient. She was in a very good mood and she seems that she started to get used to exercise her leg. Patient told us that on the weekend doctor will remove the stitches and the scar will be not covered anymore. So, from Monday I will start therapy for the scar also.

Self-therapy:

Patient must do as much as possible the strengthening exercises and ROM exercises we showed to her in bed and also try to walk through the corridor in order to feel more confident and walk with bigger steps.

Date: Monday 19/01/2015

Today's present state:

- Today is the 17th day after the surgery.
- The patient mood is good.
- Pain level 2/10.
- Observation of the scar on the right side: Scar is on the lateral part, 18 cm with no stitches on it. There is slight edema on the scar but not around the scar. The scar is restricted in upper, medial and lower part in medial and lateral direction.
- ROM in hip (flexion, abduction, extension), knee (flexion and extension): hip flexion with knee flexed (80° active and passive) and knee flexion (110° both active and passive).
- Muscle tone examination: Improvement in quadriceps femoris and adductors of the hip.
- Muscle strength test: Stronger gluteus muscles (3+)

Goals of today's therapy:

- Thromboembolic prevention.
- Improve the mobility of fascia and skin on the right thigh.
- Stitches on the scar are removed, so pressure massage for the scar.
- Relax hypertonic muscles.
- Stretch shortened muscles.
- Increase ROM in both lower extremities where is limited (mostly in hip and knee in right side).
- Strengthening hypotonic muscles.
- Walking through the corridor.
- Walk up and down the stairs.
- Breathing exercises.

Procedure:

- For thromboembolic prevention: active plantar and dorsal flexion of the ankle and circular movements of the foot were performed by the patient.
- Soft tissue technique in latero-lateral direction according to Lewit in ventral part of right thigh fascia, patient in supine position with extended knee.

- For therapy of the scar, which now is without stitches, patient was lying in supine position and i used pressure and scissors technique according Lewit.
- PIR to relax hypertonic muscles on the right side: hip adductors, quadriceps femoris according Lewit in supine position.
- In supine position, stretching of shortened muscles by passive stretching: adductors of the right hip.
- Passive movements of hip in direction of flexion, abduction and extension (3 sets, 15 times) and of knee in direction of flexion and extension (3 sets, 15 times).
- Active movements in order to increase ROM in the hip and knee joint.
 1. Flexion and extension of the knee under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 2. Flexion and extension using overball under the heel under my supervision in order to watch for any rotation of the leg during the movement (3 sets,10 times).
 3. Abduction of the hip, no gravitation, 2nd degree of muscle strength test (3 sets, 10 times).
- Strengthening exercises for the muscles around hip:
 1. Isometric exercises for strengthening quadriceps femoris (3 sets, 10 times).
 2. Another exercise for strengthening quadriceps femoris was provided by using overball under right knee and the patient pushed down the knee to the ball and he also performed dorsal flexion of the foot (3 sets, 10 times).
 3. For strengthening adductors of the hip: I placed an overball between patient's knees and she tried to push the ball (3 sets, 10 times).
 4. For strengthening both adductors and of the hip and quadriceps femoris I placed an overball between patient's knees and she tried to push the ball and at the same time she was trying to straighten one leg with dorsal flexion (3 sets, 10 times).
 5. For strengthening gluteal muscles, patient provided active elevation of pelvis (3 sets, 10 times).
 6. For strengthening both gluteal muscles and adductors of the hip, I placed an overball between patient's knees and she tried to push the ball and at the same time she elevated her pelvis (3 sets, 10 times).

7. In supine position with extended knees, I placed an elastic band over the patient's ankles and I asked her to provide abduction first of the right thigh and then of the left one (3 sets, 10 times).

8. Patient in prone position performed isometric contractions for strengthening gluteal muscles (3 sets, 10 times).

9. Also, another exercise for strengthening gluteal muscles in prone position while she was with flexed knees, we placed overball between her feet and we asked her to push her feet and try to elevate her thigh and contract her gluteal muscles (3 sets, 10 times).

- I instructed patient to try to be in upright position as much as possible when walking.
- I walked with patient up and down the stairs.

Results:

Today patient's scar was not covered and it was without stitches so I was able to make therapy to it and I could see that around the scar it was slightly swollen. Moreover, patient started walking faster, which means that she is confident and knows how to walk. Also, ROM in hip and knee joint increase even more.

Self-therapy:

For self-therapy we asked patient to continue performing all those exercises (3 sets, 10 times for each exercise) but also perform breathing exercises where she will hold with her hands her belly around her lower abdominals and she will try to breathe under her hands.

Date: Tuesday 20/01/2015

Today's present state:

- Today is the 18th day after the surgery.
- Pain level 2/10.
- ROM increased in hip abduction (20° passive movement).

Goals of today's therapy:

- Thromboembolic prevention.
- Improve the mobility of fascia and skin on the right thigh.

- Pressure massage for the scar.
- Relax hypertonic muscles.
- Stretch shortened muscles.
- Increase ROM in both lower extremities where is limited (mostly in hip and knee in right side).
- Strengthening hypotonic muscles.
- Walking through the corridor.
- Walk up and down the stairs.
- Breathing exercises.

Procedure:

- For thromboembolic prevention: active plantar and dorsal flexion of the ankle and circular movements of the foot were performed by the patient.
- Soft tissue technique in latero-lateral direction according to Lewit in ventral part of right thigh fascia, patient in supine position with extended knee. Also, soft tissue technique in latero-lateral direction according Lewit in dorsal part of right calf fascia, patient in supine position with the knee in flexion.
- For therapy of the scar, which now is without stitches, patient was lying in supine position and i used pressure and scissors technique according Lewit.
- PIR to relax hypertonic muscles on the right side: hip adductors, quadriceps femoris according Lewit in supine position.
- In supine position, stretching of shortened muscles by passive stretching: adductors of the right hip.
- Passive movements of hip in direction of flexion, abduction and extension (3 sets, 15 times) and of knee in direction of flexion and extension (3 sets, 15 times).
- Passive movements in order to increase ROM in the hip and knee joint:
 1. With small ball under the ankle and flexed knees she push down the ball with his heels and perform knee flexion and extension with my help.
- Active movements in order to increase ROM in the hip and knee joint:
 1. Flexion and extension of the knee under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 2. Flexion and extension using overball under the heel under my supervision in order to watch for any rotation of the leg during the movement (3 sets,10 times).

3. Abduction of the hip, no gravitation, 2nd degree of muscle strength test (3 sets, 10 times).
- Strengthening exercises for the muscles around hip:
 1. Isometric exercises for strengthening quadriceps femoris (3 sets, 10 times).
 2. Another exercise for strengthening quadriceps femoris was provided by using overball under right knee and the patient pushed down the knee to the ball and he also performed dorsal flexion of the foot (3 sets, 10 times).
 3. For strengthening adductors of the hip: I placed an overball between patient's knees and she tried to push the ball (3 sets, 10 times).
 4. For strengthening both adductors and of the hip and quadriceps femoris I placed an overball between patient's knees and she tried to push the ball and at the same time she was trying to straighten one leg with dorsal flexion (3 sets, 10 times).
 5. For strengthening low back muscles and gluteal muscles, patient provided active elevation of pelvis (3 sets, 10 times).
 6. Pelvis up and down (the same exercise as above but with the ankles being under a big ball (3 sets, 10 times).
 7. For strengthening both gluteal muscles and adductors of the hip, I placed an overball between patient's knees and she tried to push the ball and at the same time she elevated her pelvis (3 sets, 10 times).
 8. For strengthening hamstrings: patient was in supine position and her lower legs were hanging in a big ball. I ask patient to push with her heels the ball (3 sets, 10 times).
 9. Patient in prone position performed isometric contractions for strengthening gluteal muscles (3 sets, 10 times).
 10. Also, another exercise for strengthening gluteal muscles in prone position while she was with flexed knees, i placed overball between her feet and we asked her to push her feet and try to elevate her thigh and contract her gluteal muscles (3 sets, 10 times).
 - Breathing exercises holding with hands on the lower abdominal area and she tries to breath under her hands.
 - We instructed our patient to try to be in upright position as much as possible when walking.
 - I walked with patient up and down the stairs.

Results:

Patient was very tired, but that's logical due to the reason that we performed many exercises with her today. Although, she followed my commands without problems.

Self-therapy:

We asked patient to concentrate on breathing exercises, thromboembolic exercises, ROM exercises and strengthening exercises.

Date: Wednesday 21/01/2015

Today's present state:

- Today is the 19th day after the surgery.
- Pain level 2/10.
- ROM increased in hip flexion with knee flexed (85° passive) and knee flexion (115° passive movement.).

Goals of today's therapy:

- Thromboembolic prevention.
- Improve the mobility of fascia and skin on the right thigh.
- Pressure massage for the scar.
- Relax hypertonic muscles.
- Stretch shortened muscles.
- Increase ROM in both lower extremities where is limited (mostly in hip and knee in right side).
- Strengthening hypotonic muscles.
- Walking through the corridor.
- Walk up and down the stairs.
- Breathing exercises.

Procedure:

- For thromboembolic prevention: active plantar and dorsal flexion of the ankle and circular movements of the foot were performed by the patient.
- Soft tissue technique in latero-lateral direction according to Lewit in ventral part of right thigh fascia, patient in supine position with extended knee.
- For therapy of the scar, which now is without stitches, patient was lying in supine position and i used pressure and scissors technique according Lewit.
- PIR to relax hypertonic muscles on the right side: hip adductors, quadriceps femoris according Lewit in supine position.
- In supine position, stretching of shortened muscles by passive stretching: adductors of the right hip.
- Passive movements of hip in direction of flexion, abduction and extension (3 sets, 15 times) and of knee in direction of flexion and extension (3 sets, 15 times).
- Passive movements in order to increase ROM in the hip and knee joint:
 1. With small ball under the ankle and flexed knees she push down the ball with his heels and perform knee flexion and extension with my help.
- Active movements in order to increase ROM in the hip and knee joint:
 1. Flexion and extension of the knee under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
 2. Flexion and extension using overball under the heel under my supervision in order to watch for any rotation of the leg during the movement (3 sets,10 times).
 3. Abduction of the hip, no gravitation, 2nd degree of muscle strength test (3 sets, 10 times).
- Strengthening exercises for the muscles around hip:
 1. Isometric exercises for strengthening quadriceps femoris (3 sets, 10 times).
 2. Another exercise for strengthening quadriceps femoris was provided by using overball under right knee and the patient pushed down the knee to the ball and he also performed dorsal flexion of the foot (3 sets, 10 times).
 3. For strengthening adductors of the hip: I placed an overball between patient's knees and she tried to push the ball (3 sets, 10 times).
 4. For strengthening both adductors and of the hip and quadriceps femoris I placed an overball between patient's knees and she tried to push the ball and at

the same time she was trying to straighten one leg with dorsal flexion (3 sets, 10 times).

5. For strengthening low back muscles and gluteal muscles, patient provided active elevation of pelvis (3 sets, 10 times).

6. Pelvis up and down (the same exercise as above but with the ankles being under a big ball).

7. For strengthening both gluteal muscles and adductors of the hip, I placed an overball between patient's knees and she tried to push the ball and at the same time she elevated her pelvis (3 sets, 10 times).

8. For strengthening hamstrings: patient was in supine position and her lower legs were hanging in a big ball. I ask patient to push with her heels the ball (3 sets, 10 times).

9. Patient in prone position performed isometric contractions for strengthening gluteal muscles (3 sets, 10 times).

10. Also, another exercise for strengthening gluteal muscles in prone position while she was with flexed knees, i placed overball between her feet and we asked her to push her feet and try to elevate her thigh and contract her gluteal muscles (3 sets, 10 times).

- Breathing exercise: I ask her to breath in and out on her abdominal area while she was in supine position with flexed knees and an elastic band around her knees. During breath in, she was extending her knee and during breath out she was took her knee back to the starting position (3 sets, 10 times).
- We instructed our patient to try to be in upright position as much as possible when walking.
- I walked with patient up and down the stairs.

Results:

The scar today was more flexible than the two previous times I saw patient.

Self-therapy:

For one more time, we instruct her to keep exercise in bed as much as possible. Each exercise should be performed with 3 sets, 10 repetitions.

Date: Thursday 22/01/2015

Today's present state:

- Today is the 20th day after the surgery.
- Pain level 1/10.
- Scar is more flexible now especial on the upper and medial part. Lower part is more restricted.
- Adductors of the hip and hamstrings are stronger (grade 3+ of muscle strength test).

Goals of today's therapy:

- Thromboembolic prevention.
- Improve the mobility of fascia and skin on the right thigh.
- Pressure massage for the scar.
- Relax hypertonic muscles.
- Stretch shortened muscles.
- Increase ROM in both lower extremities where is limited (mostly in hip and knee in right side).
- Strengthening hypotonic muscles.
- Walking through the corridor.
- Walk up and down the stairs.
- Breathing exercises.

Procedure:

- For thromboembolic prevention: active plantar and dorsal flexion of the ankle and circular movements of the foot were performed by the patient.
- Soft tissue technique in latero-lateral direction according to Lewit in ventral part of right thigh fascia, patient in supine position with extended knee. Also, soft tissue technique in latero-lateral direction according Lewit in dorsal part of right calf fascia, patient in supine position with the knee in flexion.
- For therapy of the scar, which now is without stitches, patient was lying in supine position and i used pressure and scissors technique according Lewit.
- PIR to relax hypertonic muscles on the right side: hip adductors, quadriceps femoris according Lewit in supine position.

- In supine position, stretching of shortened muscles by passive stretching: adductors of the right hip.
- Passive movements of hip in direction of flexion, abduction and extension (3 sets, 15 times) and of knee in direction of flexion and extension (3 sets, 15 times).
- Passive movements in order to increase ROM in the hip and knee joint:
 1. With small ball under the ankle and flexed knees she push down the ball with his heels and perform knee flexion and extension with my help.
- Active movements in order to increase ROM in the hip and knee joint:
 1. Flexion and extension of the knee under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).
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 3. Abduction of the hip, no gravitation, 2nd degree of muscle strength test (3 sets, 10 times).
- Strengthening exercises for the muscles around hip:
 1. Isometric exercises for strengthening quadriceps femoris (3 sets, 10 times).
 2. Another exercise for strengthening quadriceps femoris was provided by using overball under right knee and the patient pushed down the knee to the ball and he also performed dorsal flexion of the foot (3 sets, 10 times).
 3. For strengthening adductors of the hip: I placed an overball between patient's knees and she tried to push the ball (3 sets, 10 times).
 4. For strengthening both adductors and of the hip and quadriceps femoris I placed an overball between patient's knees and she tried to push the ball and at the same time she was trying to straighten one leg with dorsal flexion (3 sets, 10 times).
 5. For strengthening gluteal muscles, patient provided active elevation of pelvis (3 sets, 10 times).
 6. Pelvis up and down (the same exercise as above but with the ankles being under a big ball (3 sets, 10 times).
 7. For strengthening both gluteal muscles and adductors of the hip, I placed an overball between patient's knees and she tried to push the ball and at the same time she elevated her pelvis (3 sets, 10 times).

8. For strengthening hamstrings: patient was in supine position and her lower legs were hanging in a big ball. I ask patient to push with her heels the ball. Also, she can elevate slightly her on leg and push the heel of the other leg into the ball (3 sets, 10 times).

9. Patient in prone position performed isometric contractions for strengthening gluteal muscles (3 sets, 10 times).

10. Also, another exercise for strengthening gluteal muscles in prone position while she was with flexed knees, i placed overball between her feet and we asked her to push her feet and try to elevate her thigh and contract her gluteal muscles (3 sets, 10 times).

- Breathing exercise: I ask her to breath in and out on her abdominal area while she was in supine position with flexed knees and an elastic band around her knees. During breath in, she was extending her knee and during breath out she was took her knee back to the starting position (3 sets, 10 times).
- We instructed our patient to try to be in upright position as much as possible when walking.
- I walked with patient up and down the stairs.

Results:

I could see today that she had a big improvement in everything. Her scar was more flexible. I could also see that the strength of the muscles was increased and that she started to be able to have her leg against gravity.

Self-therapy:

We said to her to concentrate mostly on ROM and strengthening exercises.

Date: Friday 23/01/2015

Today's present state:

- Today is the 21th day after the surgery.
- Pain level 1/10.
- Patient was in a very good mood and she said to us that she feel stronger and more confident now (when walking and when performing the exercises).

Goals of today's therapy:

- Thromboembolic prevention.
- Improve the mobility of fascia and skin on the right thigh.
- Pressure massage for the scar.
- Relax hypertonic muscles.
- Stretch shortened muscles.
- Increase ROM in both lower extremities where is limited (mostly in hip and knee in right side).
- Strengthening hypotonic muscles.
- Walking through the corridor.
- Walk up and down the stairs.
- Breathing exercises.

Procedure:

- For thromboembolic prevention: active plantar and dorsal flexion of the ankle and circular movements of the foot were performed by the patient.
- Soft tissue technique in latero-lateral direction according to Lewit in ventral part of right thigh fascia, patient in supine position with extended knee.
- For therapy of the scar, which now is without stitches, patient was lying in supine position and i used pressure and scissors technique according Lewit.
- PIR to relax hypertonic muscles on the right side: hip adductors, quadriceps femoris according Lewit in supine position.
- In supine position, stretching of shortened muscles by passive stretching: adductors of the right hip.
- Passive movements of hip in direction of flexion, abduction and extension (3 sets, 15 times) and of knee in direction of flexion and extension (3 sets, 15 times).
- Passive movements in order to increase ROM in the hip and knee joint:
 1. With small ball under the ankle and flexed knees she push down the ball with his heels and perform knee flexion and extension with my help.
- Active movements in order to increase ROM in the hip and knee joint:
 1. Flexion and extension of the knee under my supervision in order to watch for any rotation of the leg during the movement (3 sets, 10 times).

2. Flexion and extension using overball under the heel under my supervision in order to watch for any rotation of the leg during the movement (3 sets,10 times).
 3. Abduction of the hip, no gravitation, 2nd degree of muscle strength test (3 sets, 10 times).
- Strengthening exercises for the muscles around hip:
 1. Isometric exercises for strengthening quadriceps femoris (3 sets, 10 times).
 2. Another exercise for strengthening quadriceps femoris was provided by using overball under right knee and the patient pushed down the knee to the ball and he also performed dorsal flexion of the foot (3 sets, 10 times).
 3. For strengthening adductors of the hip: I placed an overball between patient's knees and she tried to push the ball (3 sets, 10 times).
 4. For strengthening both adductors and of the hip and quadriceps femoris I placed an overball between patient's knees and she tried to push the ball and at the same time she was trying to straighten one leg with dorsal flexion (3 sets, 10 times).
 5. For strengthening gluteal muscles, patient provided active elevation of pelvis (3 sets, 10 times).
 6. Pelvis up and down (the same exercise as above but with the ankles being under a big ball).
 7. For strengthening both gluteal muscles and adductors of the hip, I placed an overball between patient's knees and she tried to push the ball and at the same time she elevated her pelvis.
 8. For strengthening hamstrings: patient was in supine position and her lower legs were hanging in a big ball. I ask patient to push with her heels the ball. Also, she can elevate slightly her on leg and push the heel of the other leg into the ball.
 9. Patient in prone position performed isometric contractions for strengthening gluteal muscles.
 10. Also, another exercise for strengthening gluteal muscles in prone position while she was with flexed knees, i placed overball between her feet and we asked her to push her feet and try to elevate her thigh and contract her gluteal muscles.
 - Breathing exercise: I ask her to breath in and out on her abdominal area while she was in supine position with flexed knees and an elastic band around her

knees. During breath in, she was extending her knee and during breath out she was took her knee back to the starting position.

- We instructed our patient to try to be in upright position as much as possible when walking.
- I walked with patient up and down the stairs.

Results:

Today it was the last session with the patient. She improved ROM in hip and knee joint. She could also walk more confident and with bigger steps compared to when we started the therapies. Patient changed also her walking pattern, she walks in an upright position (not bending forward). She said that she was feeling better and stronger and if she continues exercise like this she will see even better results.

Self-therapy:

She can make all the exercises we told her, as long she is sure that she is performing them right.

3.6. Final Kinesiologic Examination:

- Observation
- Postural examination
- Gait examination
- Breathing examination
- Anthropometric measurements
- Soft tissue examination by Lewit
- Muscle tone examination (palpation)
- Muscle strength test by Kendall
- Muscle length test by Janda
- Examination of movement patterns by Janda
- ROM examination by Kendall
- Joint play examination by Lewit
- Neurological examination

3.6.1. Observation:

- There is no swelling on the right thigh and calf.
- The scar is located on the lateral side of the right thigh. Scar doesn't have stitches and it is quite thin. There is no redness on the scar.
- No redness around the scar and generally around the leg but there is a hematoma on the posterior part of the thigh.

3.6.2. Postural examination by Kendall:

Posterior view:

- Narrow base of support.
- Left feet slightly in external rotation.
- Slight valgosity of both ankles (more on the right side).
- Slight valgosity of both knees (more on the right side).
- Popliteal fossas are on the same level.
- Right subgluteal line is higher than left one.
- Left posterior iliac spine is lower than right posterior iliac spine.
- Left anterior iliac spine is also lower than right anterior iliac spine.
- Right iliac crest is higher than left iliac crest.
- Patient has scoliosis at thoracic part of the spine starting from Th8 (going to the right side).
- Scapulas are on the same level.
- Not winged scapulas.
- Left shoulder is higher than the left one.
- Head is slightly rotated to the left side.

Lateral view from the right side:

- Right knee is slightly semiflexed.
- Slight posterior tilt of pelvis.
- Thoracolumbar part of the spine is kyphotic starting from L3 and ending on Th4.
- Cervical part of the spine is flat.
- Shoulders are slightly forward because of the crutches.
- Head is slightly forward.

Lateral view from the left side:

- Left knee is slightly extended.
- Slight posterior tilt of pelvis.
- Thoracolumbar part of the spine is kyphotic starting from L3 and ending on Th4.
- Cervical part of the spine is flat.
- Shoulders are slightly forward because of the crutches.
- Head is slightly forward.

Anterior view:

- Feet are not flat, there is more space on her left feet.
- Slight valgosity of both ankles.
- Slight valgosity of both knees.
- Left thoracobrachial triangle is slightly bigger than the right one.
- Internal rotation of the patellas in both sides.
- Hypotonic abdominal muscles.
- Left shoulder is slightly elevated.
- Head is slightly rotated to the left side.

* Other examinations such as modification of stance and two-scale test were not performed due to the reason that the patient was using crutches and it was not possible. Moreover, I didn't perform dynamic spine examination, but I should have performed it sitting position.

3.6.3. Gait examination:

The patient is walking with underarm crutches and she is using the 3- point alternate gait.

- Bigger base of support.
- She has quite periodic walking rhythm.
- She has a faster walking speed.
- She walks with bigger steps.
- When she steps on a foot, she steps with the heel first.
- Valgosity of the knees.
- Most of the times she is in upright position during walking (no forward bending).
- No movement of the head.

- She is stable when walking.

Patient during walking with crutches she is using around 30 % loading with the operated leg.

3.6.4. Breathing examination:

Patient for breathing examination she was lying in supine position with extended knees.

- Patient doesn't use lower abdominals for breathing.
- Mobilization of the thorax is good.

3.6.5. Anthropometric measurements:

Lower Extremities	Left	Right
Functional length ASIS	89 cm	89 cm
Functional length (umbilicus)	96 cm	96 cm
Anatomical length	89 cm	89 cm

Table 19- Final Anthropometric measurements for length of lower extremities.

Lower Extremities	Left	Right
Thigh (15 cm above knee)	45 cm	45 cm
Thigh (10 cm above knee)	39 cm	39 cm
Knee	36 cm	36 cm
Calf	31 cm	31 cm
Ankle	31 cm	31 cm
Foot	23 cm	23 cm

Table 20- Final Anthropometric measurements for circumferences of lower extremities.

3.6.6. Soft tissue examination by Lewit:

- Examination of fascia of lower extremities: Fascia on the right hip on the medial and anterior part on caudal and cranial direction are slightly restricted but better compared to the initial kinesiologic examination. Examination of the fascia in the lateral part was performed also because the stitches are removed and it is slightly restricted. Also, fascia of calf is not restricted.
- Superficial layers of skin: No restriction on the posterior part of the thigh. On the anterior, lateral and medial part of the thigh on the cranial, caudal, medial and lateral direction there is slightly restriction of the skin but improved.
- Scar: the lower part of the scar is mostly restricted, the middle and the upper part are slightly restricted in medial and lateral direction.

3.6.7. Muscle tone examination (Palpation):

Tested muscle	Left	Right
Quadriceps Femoris muscle	Hypertonic	Hypertonic
Gluteal muscles (Gluteus medius, Gluteus maximus)	Hypotonic	Hypotonic
Hamstrings	Normal	Normal
Adductors (Adductor magnus, brevis, longus, gracilis, pectineus)	Normal	Normal
Iliopsoas muscle	Normal	Normal
Tensor fasciae latae	Normal	Normal
Erector spinae	Normal	Normal
Quadratus lumborum	Normal	Normal

Table 21- Final muscle tone examination by Lewit

3.6.8. Muscle strength test by Kendall:

Lower extremity muscles:

Tested muscle	Left	Right
Quadriceps femoris	4	3+
Gluteus minimus and maximus	4	3+
Hamstrings	4	3+
Hip abductors (gluteus maximus and tensor fascia latae)	4	3+
Adductors	4	3+
Ankle dorsal flexors	4+	4
Ankle plantar flexors	4+	4+

Table 22- Final muscle strength examination by Kendall

3.6.9. Muscle length test by Janda:

Examined muscle	Left	Right
Gastrocnemius	0	0
Soleus	0	0
Adductors of the hip	0	2
Paravertebral muscles	0	0

* Length test of hip flexors and hip extensors was not examined because patient didn't feel so comfortable with the position.

Table 23- Final muscle length examination by Janda

3.6.10. Examination of movement patterns by Janda:

Type of pattern	Left	Right
Hip abduction	Normal	Normal
Hip extension	Normal	Normal

Table 24- Final examination of movement patterns by Janda

3.6.11. ROM examination by Kendall:

Lower extremity:

HIP JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	5° – 0° – 100°	10° – 0° – 100°	5° – 0° – 85°	5° – 0° – 85°
F	20° – 0° – 0°	25° – 0° – 0°	20° – 0° – *0°	20° – 0° – *0°

- Adduction, external and internal rotation are contraindicated after total hip replacement surgery.

Table 25- R.O.M. (hip joint) by Kendall

KNEE JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	0° – 0° – 110°	0° – 0° – 120°	0° – 0° – 110°	0° – 0° – 115°

Table 26- Final R.O.M. (knee joint) by Kendall

ANKLE JOINT				
Plane	Left side		Right side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
S	30° – 0 – 20°	35° – 0 – 20°	35° – 0 – 20°	35° – 0 – 20°
Rs	25° – 0 – 30°	25° – 0 – 30°	25° – 0 – 30°	25° – 0 – 30°

Table 27- Final R.O.M. (ankle joint) by Kendall

3.6.12. Joint play examination by Lewit:

Joint	Left	Right
Patella (medial, lateral, cranial and caudal directions)	Not Restricted	Restricted in cranial direction
Tibiofibular joint in dorsal and ventral directions	Not Restricted	Not restricted
Talocrural joint in dorsal and ventral directions	Not Restricted	Not restricted
Lisfranc's joint in dorsal and ventral directions	Not Restricted	Not restricted
Chopart's joint in dorsal and ventral directions	Not Restricted	Not restricted
Metatarsophalangeal joints in plantar, dorsal and lateral directions	Not Restricted	Slightly restricted in plantar and dorsal direction
Interphalangeal joints in plantar, dorsal and lateral directions	Not Restricted	Slightly restricted in plantar direction

Table 28 – Final joint play examination by Lewit

3.6.13. Neurological examination:

Superficial sensation:

	Left	Right
Dermatome of L1 segment	Normal sensation	Normal sensation
Dermatome of L2 segment	Normal sensation	Normal sensation
Dermatome of L3 segment	Normal sensation	Normal sensation
Dermatome of L4 segment	Normal sensation	Normal sensation
Dermatome of L5 segment	Normal sensation	Normal sensation
Dermatome of S1 segment	Normal sensation	Normal sensation
Dermatome of S2 segment	Normal sensation	Normal sensation

Table 29- Final neurological examination- dermatomes examination

Deep tendon reflexes:

	Left	Right
Knee reflex	2	2
Achilles tendon reflex/ Medioplantar	2	2

Table 30- Final neurological examination- deep tendon reflexes

3.7. Evaluation of the Effect of the Therapy:

Comparing the results of initial kinesiologic examination and final kinesiologic examination, therapy was effective. I could see it from the results and also the patient could feel it. According to VAS scale, the pain is even more reduced now. She said that she feels pain 2/10. The edema and swelling around the thigh and the knee are not present now. Moreover, soft tissue techniques improve the superficial tissue, fascia and skin and now they are not so restricted as they were at the initial kinesiologic examination. Concretely, fascia on the right hip on the medial and anterior part on caudal and cranial direction are slightly restricted but better compared to the initial kinesiologic examination. Also, fascia of calf is not restricted. On the anterior, lateral and medial part of the thigh on the cranial, caudal, medial and lateral direction there is

still a little bit restriction of the skin but improved. Also, the scar has no stitches so I performed therapy on it. The lower part of the scar now is mostly restricted, the middle and the upper part are slightly restricted in medial and lateral direction. Posture and gait were better due to the reason that she is able now to stand upright, she is more stable and able to make bigger steps. The strength of weak muscles has improved (most of the muscles are graded on 3+), but it still needs a lot of work. The hypertonic muscles have now reduced tension due to the PIR exercises. ROM of hip at flexion, abduction, extension and knee at flexion increased. All of the joints at the right side are not restricted. The only thing I could think that was not improved so much was breathing and stretching of the adductor muscles on the right side, which is still grade 2 according to muscle length test by Janda. Finally, patient was very cooperative with me. Even though at the first sessions we have begin together she was tired very easily, she said that now she feels better and improved compared to the first session.

4. Conclusion:

Checking day-by-day results, I could see that the therapy was effective. Patient at the end of each session was feeling better and better. We succeed to correct as much as possible in the period of 2 weeks the muscle imbalances, increase ROM, relax and strength the muscles. The result was an improved posture and gait pattern with no pain. Also, patient now gained confidence (when walking, when performing the exercises). At the end, she was satisfied from the results and the most important thing for her is to return to her ADL activities as soon as possible and she was very motivated for that.

During practice at the hospital, I gained valuable experiences, which are going to help in my whole life. Of course, I learnt something new every day from my supervisor. She was correcting me and she kept informing me with something new every day and I'm very thankful for that. This contributed to the success and fulfillment of short-term goals in the practice.

Prognosis: If she will continue exercising her operated leg (following the programme that i showed to her) and if she does so as the time will pass, she will continue to see positive results on her leg.

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The citation of the references in the bibliography is according to APA citation norm.

6. SUPPLEMENTS

6.1. List of pictures:

Picture No.1- general anatomy and bones of the hip joint

Picture No.2- anterior and posterior ligaments of hip joint

Picture No.3- muscles that surround the hip joint from the posterior view

Picture No.4- the nerves of the hip from the posterior view

Picture No.5- blood vessels that supply the hip joint

Picture No.6- different forces of the hip joint

Picture No.7- polyarthritis of the hands

6.2. List of tables:

Table No.1- Anthropometric measurements for length of lower extremities.

Table No.2- Anthropometric measurements for circumferences of lower extremities.

Table No.3- Muscle tone examination

Table No.4- Muscle strength examination by Kendall

Table No.5- Muscle length examination by Janda

Table No.6- Examination of movement patterns by Janda

Table No.7- R.O.M. (hip joint) by Kendall

Table No.8- R.O.M. (knee joint) by Kendall

Table No.9- R.O.M. ankle joint) by Kendall

Table No.10- R.O.M. (shoulder joint) by Kendall

Table No.11- R.O.M. (elbow joint) by Kendall

Table No.12- R.O.M. (radioulnar joint) by Kendall

Table No.13- R.O.M. (wrist joint) by Kendall

Table No.14- R.O.M. (MP joint of 2-5 fingers) by Kendall

Table No.15- R.O.M. (IP joint of 2-5 fingers) by Kendall

Table No.16- Joint play examination by Lewit

Table No.17- Neurological examination- dermatomes examination

Table No.18- Neurological examination- deep tendon reflexes

Table No.19- Final Anthropometric measurements for length of lower extremities.

Table No.20- Final Anthropometric measurements for circumferences of lower extremities.

Table No.21- Final muscle tone examination by Lewit

Table No.22- Final muscle strength examination by Kendall

Table No.23- Final muscle length examination by Janda

Table No.24- Final examination of movement patterns by Janda

Table No.25- Final R.O.M. (hip joint) by Kendall

Table No.26- Final R.O.M. (knee joint) by Kendall

Table No.27- Final R.O.M. (ankle joint) by Kendall

Table No.28- Final joint play examination by Lewit

Table No.29- Final neurological examination- dermatomes examination

Table No.30- Final neurological examination- deep tendon reflexes

6.3. List of abbreviation

R.O.M. – Range of motion

PIR – Post isometric relaxation

ADL – Activities of Daily Living

BMI – Body Mass Index

IP – Interphalangeal

MCP – Metacarpophalangeal

VAS – Visual Analog Scale

SFTR – Saggital, frontal,transverse, rotation method

Application for Ethics Board Review



CHARLES UNIVERSITY IN PRAGUE
FACULTY OF PHYSICAL EDUCATION AND SPORT
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Application for Ethics Board Review

of the research project, doctoral research, master degree research, undergraduate research, involving human subjects

Project title: Case study of a patient with the diagnosis of polyarthritis after total hip replacement

Nature of the research project: undergraduate research*

Author (chief investigator): Eleni Tsolakki

Supervisor (in case of student research): Mgr. Helena Vomáčková

Research project description Case study of physiotherapy treatment of a patient with the diagnosis of polyarthritis after total hip replacement will be conducted under the expert supervision of an experienced physiotherapist at Revmatologický Ústav.
Guaranteed safety to be judged by experts: rationale for the use of invasive methodologies, procedures minimizing the risk to subjects
Ethical aspects of the research: special rationale for research involving children, pregnant and nursing women, mentally disabled, prisoners and persons in underdeveloped communities (see the Ethics Board Code, Faculty of Physical Education and Sport, Charles University, and International Ethical Guidelines 5, 6, 7, 8 and 11)
Informed consent (attached)

Date: 22.1.2015

Author's signature:

Faculty of Physical Education and Sport, Charles University in Prague ETHICS BOARD REVIEW

Ethics Board members: Prof. Ing. Václav Bunc, CSc.
Prof. PhDr. Pavel Slepíčka, DrSc.
Doc. MUDr. Jan Heller, CSc.

The Ethics Board at the Faculty of Physical Education and Sport, Charles University, approved the research project.

Approval number: 007/2015
Date: 23.1.2015

The Ethics Board at the Faculty of Physical Education and Sport, Charles University, reviewed the submitted research project and found no contradictions with valid principles, regulations and international guidelines for biomedical research involving human subjects.

The chief investigator of the project met the necessary requirements for receiving the Ethics Board approval.

UNIVERZITA KARLOVA v Praze
Fakulta tělesné výchovy a sportu
José Martího 31, 162 52, Praha 6

Official school stamp

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Signature, REB Chairman

INFORMOVANÝ SOUHLAS

Student: Eleni Tsolakki, FTVS UK

Pracoviště: Revmatologický ústav, Na Slupi 4, Praha 2, 128 50

V souladu se Zákonem o péči o zdraví a lidu (§ 23 odst. 2 zákona č. 20/1966 Sb.) a Úmluvou o lidských právech a biomedicíně č. 96/2001, Vás žádám o souhlas k vyšetření a následné terapii. Dále Vás žádám o souhlas k nahlížení do Vaší dokumentace osobou získávající způsobilost k výkonu zdravotnického povolání v rámci praktické výuky a o souhlas k fotodokumentaci. Při vyšetření a terapii nebudou použity žádné invazivní metody. Dále žádám o souhlas k uveřejnění výsledků vyšetření a terapie a fotografií v rámci bakalářské práce na FTVS UK. Získaná data nebudou zneužita a osobní data v této práci nebudou uvedena.

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Prohlašuji, že jsem shora uvedenému poučení plně porozuměla a výslovně souhlasím s provedením vyšetření a následnou terapií.

Souhlasím s nahlížením výše jmenované osoby do mé dokumentace, fotodokumentaci a s uveřejněním výsledků terapie v rámci studie.

Datum:.....

Podpis osoby, která provedla poučení:

Vlastnoruční podpis pacientky: