Charles University in Prague
Faculty of Physical Education and Sports

Case study of Physiotherapy Treatment of a Patient with Psoriatic Arthritis after Total hip Arthroplasty.

Bachelor Thesis

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April 2012, Prague

Declaration

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

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

Christian Enstad
Prague, April 2012

Acknowledgment

I would first and foremost like to thank my girlfriend and companion Marianne for all her support during my stay in Prague. The appreciation for her support could can not be described. I would also like to extent my gratitude towards my family. Their support has been most appreciated and I'm very thankful.

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Thank you all.

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Prague, April 2012

Abstract

Title:

EN: Case study of physiotherapy treatment of a patient with Psoriatic Arthritis after Total hip arthroplasty.

CZ: Případová studie fyzioterapie léčby pacienta s psoriatické artritidy po totální endoprotézy kyčelního kloubu.

Thesis aim:

In this thesis I will aim to discuss the rehabilitation after a total hip arthroplasty in a patient with psoriatic arthritis. The thesis is divided into two parts, one theoretical where the aim will be to explain some of the current research concerning psoriatic arthritis and total hip replacement. It will be focused on the anatomical, bio-mechanical and kinesiological properties of the lower extremities as well as the surgical procedure of total hip arthroplasty and following rehabilitation. I will also briefly look at the epidemiology and etiology of psoriatic arthritis and associated symptoms. The second part will focus on a 67 year old woman with the mentioned diagnosis in the post-operative state 2 weeks after surgery. The practical part aim to describe examination, therapeutical approach and conclusions after one week of examination and therapy.

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1. Preface

This bachelor thesis is divided into two different parts. The first part is focused on the theoretical point of post-operative rehabilitation of total hip arthroplasty. It's divided into separate parts discussing anatomy of the lower extremity and the role it plays in ADL. Biomechanics of the hip joint and its mechanical properties and the different cases and rehabilitation of total hip arthroplasty.

In the second part of the bachelor thesis the examination and the therapy progress of the patient with the given diagnosis will be discussed. A full examination and therapy execution is described. This was executed by the author in cooperation with the supervisor at the facility where the bachelor practice was carried out. The progress of the therapy and conclusions of both examination and therapy are evaluated the point out the degree of success of the rehabilitation process.

The thesis is equipped with a list of literature, figures, explanation of abbreviations and application of board review which are found at the last pages of the thesis.

2. General part

2.1 Psoriatic Arthritis

Psoriatic arthritis is a kind of inflammatory arthritis associated with psoriasis. The cause of the disease is not jet known but it's believed to be genetically associated. The disease occur in about 15-30 percent of persons with psoriasis. The disease can effect any joint in the body and the symptoms vary somewhat from person to person (Gladman et al., 2005).

Psoriasis is a disease where scaly red patches develop on the skin. Psoriatic arthritis is believed to develop when the immunity system goes into overdrive in attempt to attack the skin disease and cause inflammation in the joints. Like the skin condition, the inflammation of the joints can flare up and subside and change location over time (Antoni et al., 2005).

The disease can affect any joint in the body and might affect one or more joints. Signs and symptoms include pain, swelling and stiffness along with redness and increased temperature. Fingers and toes might get a sausage-like appearance known as dactylitis. Pain around the the feet and ankles are common, especially tendinitis in the achilles tendon or plantar fascitis in the sole. The symptoms might also affect nail so they separate from the nail bed. It might also affect the spine. In this cases it's known as spondylitis as it is inflammation of the spinal vertebraes. It will cause stiffness and pain and difficulties in bending (Antoni et al., 2005).

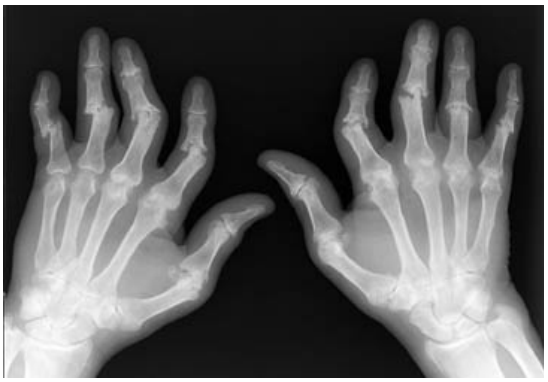

Fig. 2.19 X-ray hands. Interphalangeal joint deformation caused by psoriatic arthritis. (wikipedia.org, 2012)

Psoriatic arthritis usually appears in people between the age of 30–50, but in some cases it begin as early as childhood. Both men and women are equally at risk, but in 40 percent of the cases there is a family history of either psoriasis or psoriatic arthritis. Psoriatic arthritis might also be caused by an other infection that cause an over-activation of the immunity system. While psoriatic arthritis itself is not infectious, it might be triggered by a streptococcal throat infection (Ritchlin et al., 2009).

2.2 Epidemiology and etiology

Total hip arthroplasty is a relatively common procedure. It's the second most common replacement surgery closely following knee replacement surgery. The surgery is mostly performed in

postmenopausal woman. In most of the cases it's due to joint failure caused by osteoarthritis. Other causes might involve rheumatoid or psoriatic arthritis, avascular necrosis, traumatic arthritis, protrusio acetabuli and certain fractures as well as benign and malignant tumors, Paget's disease, ankylosing spondylitis and juvenile rheumatoid arthritis (Gladman et al 2005). The main reason for the procedure is to improve the quality of life for the patient by reducing pain and restoring function of the joint. The procedure is normally not performed before conservative treatment like physiotherapy and pharmacological treatment have failed.

2.3 Physiotherapy treatment of Psoriatic Arthritis

In addition to corticosteroids and other pharmacological treatment, external treatment can help relieve the symptoms of psoriatic arthritis. As mentioned there is no known cure so all a physiotherapist or any medical worker for that matter can do is to help relieve the symptoms and prevent escalation of the disease. The most preventive measure the physiotherapist can do is instruction of the patient in auto-therapy. Muscle strengthening and exercises of joint flexibility is the most important regime for the patient. Some of these exercises are done in the physiotherapy clinic, but most of them are done at home as a part of the patients daily routine. For the strengthening therapy to be effective there needs to be a balance between rest and exercise. Most patients with psoriatic arthritis are more fatigued as a symptom of their disease. Doing exercises while the patient is fatigued will not prove as effective as doing it when the patient is rested. So the patient should be encouraged to rest when they feel the need to do so. However, exercising also increase the energy level so the more the patient exercise the more energy they will have. If they get a good exercise routine they will also have more energy for other things. The goals of the strengthening is several. It's an important part of the pain management, protection of joints and the maintenance of the joint function. Controlled exercises aids to reduce pain and stiffness as well and strengthening of muscles and ligaments helps to stabilize the joints and improve posture hens the strain of the joints them self. A secondary and very beneficial effect of the exercise is weight control. For a patient with psoriatic arthritis it's important to have a weight to height ratio (BMI) within the normal boundaries, as overweight increase the strain on the joints and make the symptoms worse(Gottlieb et al., 2008).

For the clinical therapy there are a few physical therapies that helps the patient manage the symptoms. Thermal treatments that produce heat within the body tissues either to the superficial parts or the deeper parts of the body can help to reduce pain and increase the mobility of the joints and muscles. Infra-red light or heat lamps provide a superficial warming effect on the skin and

loosen the soft tissues of the superficial layers. It also induces relaxation and has a pain relieving effect. Wax baths and hot packs might have the same effect. Diathermy and shortwave diathermy gives a deep warming effect and are more suited for the deeper layers of soft tissue. This also have a relaxing effect on the muscles and soft tissues and help to improve mobility and reduce pain (Gottlieb et al., 2008).

Electrotherapy can be very effective in both the acute and chronic stage of the disease. When ever there is pain, swelling or muscle spasms present, electrotherapy can be used to reduce these symptoms. The TENS current at 140Hz with an over sensitive threshold can be applied for analgesic effect, the same current can be used for antispasmolytic effect at 182Hz. For antiedemic effect the therapist can use a low frequency diadynamic current over motoric threshold at 50Hz. The duration of the application should be according to the stage of the disease and the current in use. Other physical treatments also include ultrasound and cryotherapy.

Among the preventive measures for the progression of the disease, manual therapy can also be beneficial. Mobilization and manipulation of the affected joint can help keeping the mobility and reduce the pain. This is normally used in the chronic stages of the disease and can be a good solution if the joint is in a stage where the patient has little or no mobility. The methods should not be applied in a matter that gives the patient pain or to hard so it can cause injury to the joint or further worsen the condition. It's a method that should only be applied by trained personnel that have substantial knowledge of anatomy and proper procedures.

2.3 Anatomy of the lower extremity

The lower limb is associated with the part of the body caudally in direction of the sacroliliac joint which is anchored to the axial skeleton through strong ligaments which link the pelvic bone to the sacrum (Drake et al 2004). Based on the position of the major components of the joint the lower limb is divided into gluteal region, thigh, leg and foot. Out of this parts, hip is the major focus in this paper.

The gluteal region

The gluteal region is posterolateral and between the iliac crest and the gluteal fold that defines the lower part of the buttocks. Within this region there are several bones that articulates with each other as well as a major system of nerves and vessels. Terminal nerves that supply the lower limb

originates from the lumbosacral plexus in the abdomen and pelvis as well as vessels that also originates in the same region. As a result nerves and vessels that supply the lower extremities pass from the trunk into the lower limbs through multiple apertures in the pelvic walls or anteriorly over the superior margins of the pelvis below the attachments of the abdominal wall to the inguinal ligament.

The skeletal elements that are involved in anchoring the lower limbs to the trunk are the pelvis which is connected to the proximal part of the femur in the acetabulum of pelvis. The joint between these two parts is the hip joint.

Each pelvis bone is in turn consisting of three bones; the ilium, ischium and pubis which are fused together during childhood. The ilium is superior, the pubis anterioinferior and the ischium posteroinferior.

The ilium articulates with the sacrum. The pelvic bone is further anchored to the end of the vertebral column by the sacrotuberous and sacrospinous ligaments which attach to a tuberosity and spine on the ischium.

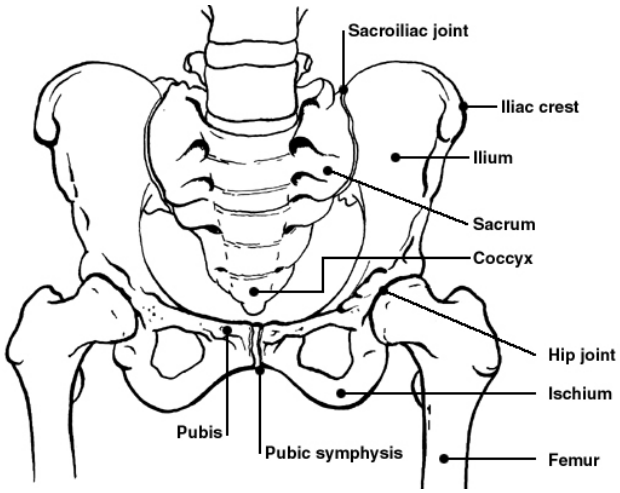

Fig. 2.1. Pelvic landmarks. Anterior view. (wikipedia.org, 2012)

The outer surface of the ilium and the connecting surface of sacrum and coccyx and sacrotuberous ligament are associated with the gluteal region of the lower limb and provide extensive muscles attachment. The ischial tuberosity are the origin for many muscles in the posterior part of the thigh and the ischiopubic ramus body of the pubis are associated with many muscles at the anterior part of the thigh. The head of femur articulates with the acetabulum on the lateral surface of the pelvic bone.

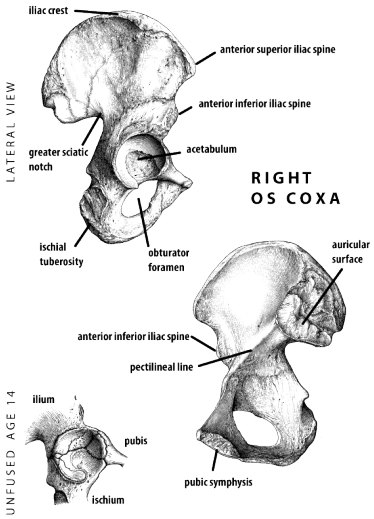

Fig. 2.2. Dexter Os Coxa. (wikipedia.org, 2012)

The upper part of the pelvic bone, the ilium, is a fan shaped part associated with the inner side of the abdomen and the upper lateral side of the lower limb. The top of this region is the iliac crest, it is often used as an assessment of the position of pelvis. The crest starts in the anterior with a prominence that is the anterior superior iliac spine, or ASIS, and ends in the posterior part with the posterior superior iliac spine or PSIS. These prominences are also often used in assessment of the position of

the pelvis as asymmetry in this region could indicate a torsion or tilt of the pelvis.

The large cup-shaped acetabulum is the point for articulation between the head of femur and the lateral surface of the pelvic bone. It's located in the region where ilium, pubis and ischium fuse together. The margin of the acetabulum is marked inferiorly with the acutabular notch. The walls of the acetabulum consists of nonarticular and articular parts.

The nonarticular part is rough and forms a shallow circular depression which is called the acetabular fossa. It's located in the central and inferior parts of the acetabular floor and the acetabular notch is a part of this formation.

The articular surface of the acetabulum is where the head of femur is in contact with the acetabular fossa. This surface is called the lunate surface and is a broad surface surrounding the anterior, superior and posterior margins of the acetabular fossa. It is broadest in the superior region where the most of the body's weight is transmitted through the pelvis to the femur.

The acetabular fossa provides attachment for the ligament of the head of the femur while blood vessels and nerves pass through the acetabular notch.

The thigh

The femur is the bone of the thigh and it's the longest bone in the body. The proximal part of the femur consists of the head and the neck and two large projections the greater and lesser trochanter on the upper part of the shaft. The head of femur is spheral and articulates with the acetabulum of the pelvic bone. Is has a pit, the fovea, on its medial side for the attachment of the ligament of the head. The neck of femur is cylindrical shaped bone that connects the head to the shaft of the femur. Is projects superomedially from the shaft at an angle of approximately 125° and slightly forward. The orientation of the neck relative of the shaft of femur contributes to increase the range of motion of the hip joint.

The greater and lesser trochanter of the femur are insertion points for muscles that moves the hip joint. The grater trochanter extents superiorly from the shaft of the femur just laterally to the region where the shaft joins the neck of the femur. It continues posteriorly where it's medial surface is deeply grooved to form the trochanteric fossa. The lateral wall of the fossa has a oval depression where the insertion of the adductor and external rotator external, obturator muscle. The greater trochanter has an elongated ridge on its anterolateral surface that is the insertion point for the gluteus minimus muscle. It has a similar ridge more posteriorly on its lateral surface that is the insertion point of gluteus medius muscle. It is possible to palpate the greater trochanter between

these two points. On the medial of the superior side of the great trochanter just above the trochanteric fossa there is a small impression that is the insertion of the obturator internus muscle and the gemelli muscle. Just over this feature there is an impression on the margin of the trochanter for the insertion of the piriformis muscle.

The lesser trochanter is as the name states smaller than the greater trochanter. It has a blunt conical shape and is located posteromedially form the shaft of the femur just inferior to the junction of the neck and shaft of the femur. It is the insertion point for the common tendon of the iliacus and psoas major commonly known as the iliopsoas muscles.

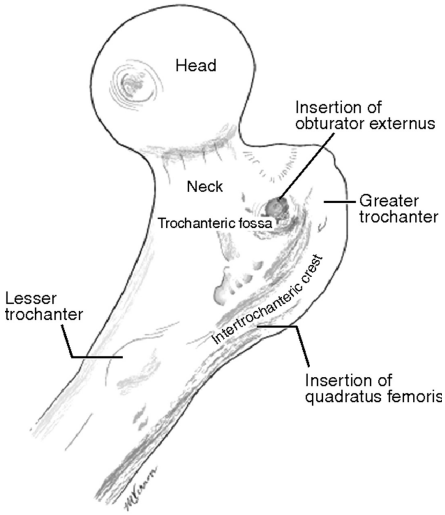

Fig. 2.3 Proximal femur.(wikipedia.org, 2012)

Between the two trochanters and separating the shaft from the neck of the femur are the intertrochanteric line and intertrochanteric crest.

The shaft of the femur descends from the neck of the femur to the coronal surface at an angle of 7° from the vertical axis. The distal end of femur is therefor closer to the midline than the proximal part. The linea aspera is a major site for muscle insertions in the first proximal third of the femur. The linea aspera continues proximally as the pectinal line and the gluteal tuberosity which is the place for insertion of the gluteus maximus muscle.

The hip joint

The hip joint is a synovial articulation between the head of femur and the acetabulum of the pelvic bone. The joint is a multiaxial socket joint designed for weightbearing and stability at the expence of mobility. Movement of the joint is in all directions; flexion, extension, abduction, adduction, internal rotation, external rotation and circumduction. When considering the movements of the hip it is important to bare in mind the angulation of the neck of the femur. Eg. Medial and lateral rotation of the femur involves a shift forward or backward of the greater and lesser trochanter relative to acetabulum.

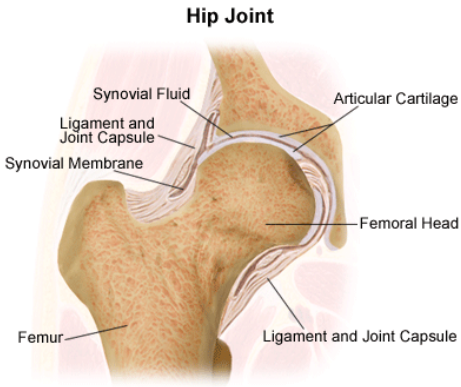

Fig. 2.4 Articular surface of dexter hip joint. Anterior view. (wikipedia.org, 2012)

The articular surfaces of the hip include the spheral head of the femur towards the lunate surface of the acetabulum. The acetabulum almost entirely encompasses the hemispherical head of the femur and contributes to the joints stability. The nonarticular acetabular fossa contains loose connective tissue. Meanwhile the lunate surface is covered by hyaline cartilage. With exception of the fovea the head of the femur is also completely covered by hyaline cartilage.

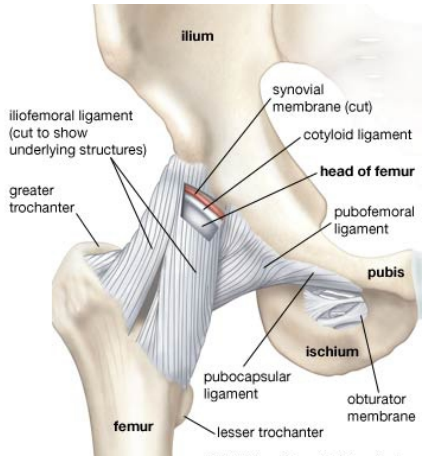

Fig. 2.5 Ligaments of dexter hip joint. Anterior view. (wikipedia.org, 2012)

Ligaments of the hip

At the inferior side of the acetabulum the transverse acetabular ligament bridges across the acetabular notch and converts the notch into a foramen. The increases the stability of the joint and holds the head of femur firmly in place.

The ligament of the head of the femur stretches from the fovea to the acetabular fossa. It is a flat band of delicate connective tissue that attaches the head of the femur to the acetabulum. It carries a small branch of the obturator artery that contributes to supply the head of femur with blood. In addition to the transverse acetabular ligament there are three ligaments reinforcing the external surface of the fibrous membrane and stabilizes the joint. There ligaments are named after the pelvic bone they are attached to, the iliofemural ligament, the pubofemoral ligament and the ischiofemoral ligament.

The iliofemoral ligament is triangular shaped and is located in the anterior to the hip joint attached to the ilium between the anterior inferior iliac spine and the margin of acetabulum and to the femur along the intertrochanteric line. Parts of the ligament attached over and under the intertrochanteric line are thicker than that in the central part of the ligament. This results in the ligament having a Y-shaped appearance.

The pubofemoral ligament is located anteroinferior to the hip joint. This ligament is also triangular in shaped and stretches between medially to the iliopubic eminence and the intertrochanteric line along with the iliofemoral ligament.

The ischiofemoral ligament reinforces the posterior aspect of the fibrous membrane and is attached laterally to the ischial tuberosity and to the intertrochanteric line along with the two other ligaments.

All the three ligaments are orientated on a spiral fashion around the hip joint. This contributes to keep the ligaments tight when the leg is extended and also assist in reducing the amount of energy required to maintain a standing position.

Gateways of the pelvis

There are mainly four gateways from the abdominal and pelvis into the lower limb. Through these gateways the lower limb is provided with nerve intervention and blood supply. These gateways are the obturator canal, the greater sciatic foramen, the lesser sciatic foramen and the gap between the inguinal ligament and the anterosuperior margin of the pelvis.

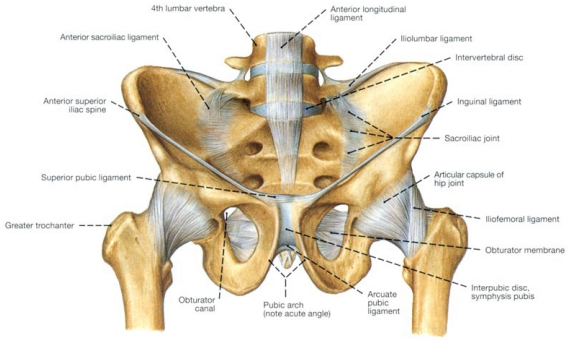

Fig. 2.6 Pelvis and proximal femurs. Anterior view. (wikipedia.org, 2012)

The obturator canal is an almost vertically oriented gateway at the anteriosuperior edge of the obturator foramen.

The greater sciatic foramen is located at the posteriolateral pelvic wall and is the major route for structures that are to pass between the pelvis and the gluteal region of the lower limb. The piriformis muscle passes out of the pelvis and into the gluteal region through the greater sciatic foramen and separates the foramen into the upper and lower part.

The lesser sciatic foramen is located inferior to the greater sciatic foramen, posteriolateral to the pelvic wall and inferior to the lateral attachment of the pelvic floor to the pelvic wall and therefor creates a pathway between the perineum to the gluteal region.

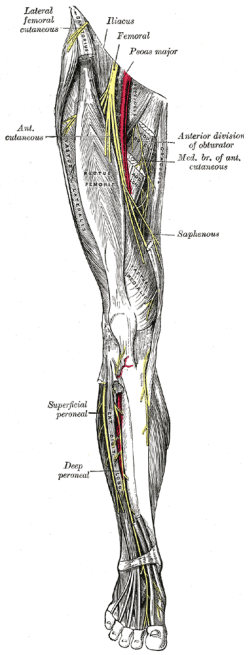

Fig. 2.7 Dexter lower extremity. Femoral nerve illustrated in yellow. (Gray 1918)

The gap between the inguinal ligament and the anterosuperior margin of the pelvic bone creates the main gateway between the abdomen and the anterior aspect of the thigh. The iliopsoas and pectineus muscles passes through this gap.

Nerves

The nerves of the lower extremities enter the lower limb from the abdomen and lumbosacral plexus through the gateways mentioned. The nerves are terminal branches of the lumbosacral plexus on the posterior wall of the pelvis and the posteriolateral walls of the pelvis. The lumbar plexus is formed by the anterior rami of the spinal nerves from the L1 to L3 and part of the L4 segment of the spine. The rest of the anterior ramus of L4 and L5 combines to form the lumbosacral plexus. These nerves enter the pelvic cavity and joins with the anteroir rami of S1 to S3 and formes the sacral plexus. Major nerves

originate in the lumbosacral plexus and intervenes the lower extremities. Among these are the femoral nerve, obturator nerve, sciatic nerve, superior gluteal nerve and inferior gluteal nerve. Other nerves that also originate in the same plexus are lateral cutaneous nerve of the thigh, nerve to obturator internus, nerve to quadratus femoris, posterior cutaneus nerve of thigh, perforating cutaneus nerve and branches of the ilio-inguinal and genitofemoral nerve.

The femoral nerve originates in the anterior rami of L2 to L4 and leaves the abdomninal cavity through the gap between inguinal ligament and superior margin of pelvis and enter the femoral triangle on the anteromedial ascpect of the thigh. The femoral nerve innervates all muscles in the anterior aspect of the thigh. Branches of the abdominal part of the nerve innervates the iliacus muscle and pectineus muscle. It also innervates the skin over the anterior aspect of the thigh, anteriomedial side of the knee, medial side of the leg and medial side of the foot.

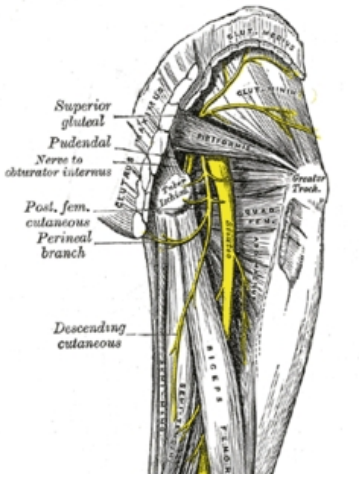

Fig. 2.9 Superior gluteal nerve seen superior to piriformis. Inferior gluteal nerve seen inferior to piriformis. (Gray 1918)

The obturator nerve also originates from L2 to L4. From its origin it passes down the posterior abdominal wall and passes into the pelvic cavity through the obturator canal. This nerve innervates all the muscles in the medial aspect of the thigh except the part of adductor magnus that originates from the ischium and the pectineus muscle. It also innervates the obturator externus muscle and the skin on the medial side of the upper thigh.

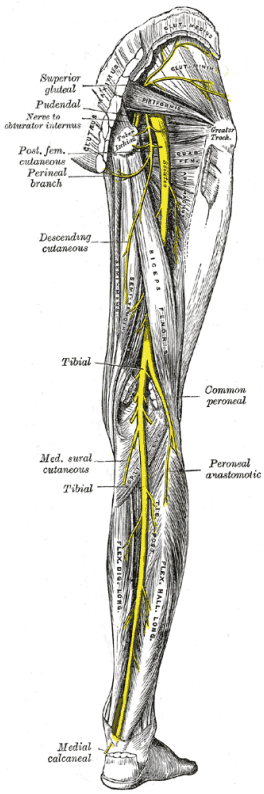

Fig. 2.8 Sciatic nerve with braches. Dexter leg posterior view. (Gray 1918)

The sciatic nerve is the largest nerve in the human body and originates from the anterior rami of L4 to S3. It leaves the pelvis trough the greater sciatic foramen inferior to the piriformis muscle, further on it passes through the gluteal region and enters the posterior aspect of the thigh where it devides into two major branches, the common fibular nerve and the tibial nerve. The posterior divisions of L4 to S2 are making up the common fibular nerve and the anterior divisions of L4 to S3 makes the tibial nerve. Together the sciatic nerve innervates all the muscles in the posterior aspect of the thigh and the part of the adductor magnus that originates from the ischium. As well as all the muscles of the leg and foot and skin on the lateral side of the leg in addition to the sole of the foot.

The gluteal nerves are divided into the superior gluteal nerve and the inferior gluteal nerve. The superior gluteal nerve originates from the anterior

rami of L4 to S1 and leaves the pelvis through the greater sciatic foramen superior to the piriformis muscle. The nerve innervates the gluteal minimus and medius muscles along with the tensor fascia latae muscle. The inferior gluteal nerve originates from L5 to S2 and leaves the pelvis through the greater sciatic foramen inferior to the piriformis muscle. It enters the gluteal region and innervates the gluteus maximus muscle.

The ilio-inguinal and genitofemoral nerves have sensory branches that originates from L1 and L2 and descends into the upper thigh from the lumbar plexus. The ilio-inguinal nerve (L1) originates from the superior part of the lumbar plexus an descends around the abdominal wall between transversus abdominis and the internal oblique and passes through the inguinal canal and in through the superficial inguinal ring. It innervate the skin on the medial side of the upper thigh and parts of the perineum.

The genitofemoral nerve passes through the psoas major muscle on the posterior abdominal wall anteroinferiorly and descends on the anterior surface of the psoas major. The femoral part of the nerve passes into the thigh by crossing under the inguinal ligament laterally to the femoral artery. It innervates the skin over the upper central part of the anterior thigh.

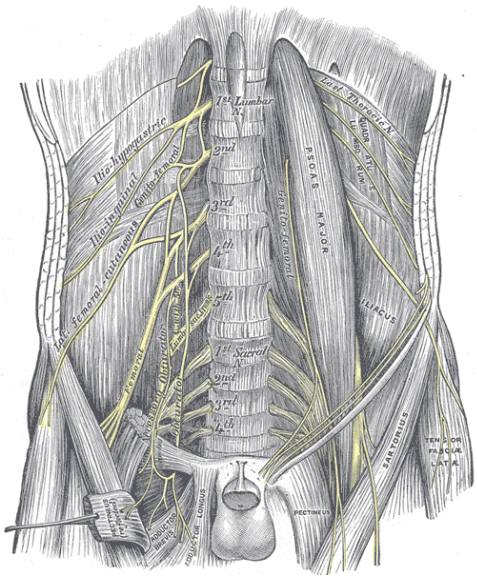

Fig. 2.10 Lumbar plexus with branches. Anterior view. (Gray 1918)

The nerve to quadratus femoris (L4 to S1) and nerve to obturator internus (L5 to S2) are motor nerves that both enter through the greater sciatic foramen inferiorly to the piriformis muscle. They both originate in the sacral plexus and are small motor nerves for the gluteal region. The nerve to obturator internus innervate the gemellus superior muscle and then loops around to the ischial spine and enter the perineum through the lesser sciatic foramen to penetrate the surface of the obturator internus muscle. The nerve to quadratus femoris enters through the same foramen and innervates the gemelus inferior muscle and quadratus femoris.

The posterior cutaneous nerve of the thigh originates from S1 to S3 and leave the sacral plexus through the greater sciatic foramen inferior to the piriformis muscle. It passes inferiorly through the gluteus maximus muscle and innervates a longitudinal band of skin over the posterior aspect of the thigh that continues down to the upper leg. It also innervate skin over the gluteal fold, over the upper medial side of the thigh and in the adjacent regions of the perineum.

Perforating cutaneous nerve is a small sensory that originates from S2 and S3. It leaves the pelvic

cavity by penetrating directly through the sacrotuberous ligament. From there is passes inferiorly around the lower boarder of the gluteus maximus where it overlaps with the cutaneous nerve of the thigh and innervates the skin on the medial aspect of the gluteal fold.

Muscles of the gluteal region

The muscles of the gluteal region is mainly devided into two major parts. A deep group and a superficial group. The deep group are mainly short muscles that are lateral rotators of the hip. This group includes piriformis, obturator internus, gemellus superior, gemellus inferior and quadratus femoris. The superficial group consists of larger muscles which are mainly abductors and extensors of the hip. This group include gluteus minimus, gluteus medius, gluteus maximus and tensor fascia latae.

The deep group

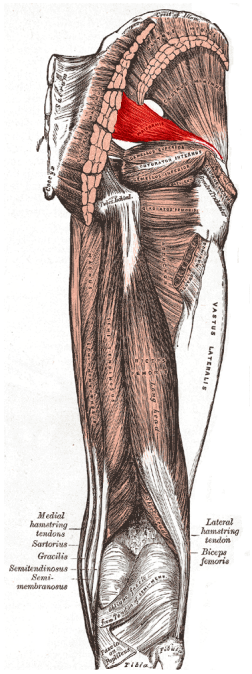

Fig. 2.11 Piriformis Muscle (Gray 1918)

The piriformis muscle is the most superior muscle in the deep group of muscles of the gluteal region. It originates from between the anterior sacral foramina and the anterolateral surface of the sacrum and passes laterally and inferiorly through the greater sciatic foramen and inserts at the facet on the upper margin of the greater trochanter. The function of piriformis is to externally rotate the hip and perform abduction of the leg. The muscle is innervated by the nerve to piriformis. In addition to the kinesiological function the piriformis muscle also divides the sciatic foramen into two regions.

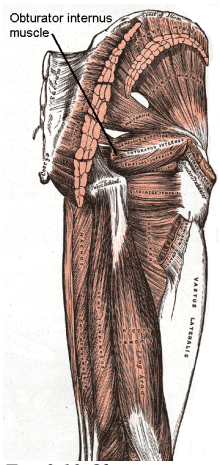

Fig. 2.12 Obturator internus seen between the Gemellus muscles. (Gray 1918)

The obturator internus muscle is a flat fan-shaped muscle originating from the medial surface of the obturator membrane and adjacent bone of the obturator foramen. It's inserted at the medial surface of the superior margin of the greater trochanter, just inferior to the insertion of the piriformis muscle. The muscle fibers of the obturator internus muscle converges from a tendon which bends 90° around the ischium between the ischial spine and ischial turberosity and passes though the lesser sciatic foramen to enter the gluteal region. Obturator internus is also an external rotator and abductor of the hip. It's innervated by the nerve to obturator internus.

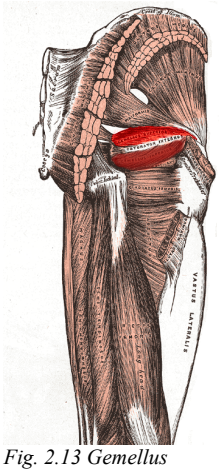

Fig. 2.13 Gemellus superior and inferior. (Gray 1918)

Gemellus superior and inferior are a pair of triangular shaped muscles that are associated with the upper and lower margins of the obturator internus tendon. The gemellus superior originates from the gluteal surface of the ischial spine. And the gemellus inferior originates from the upper gluteal and pelvic surfaces of the ischial tuberosity. Both muscles insert with the tendon of obturator internus of the greater trochanter of femur. Gemellus superior is innervated with the nerve to obturator internus and the gemellus inferior is innervated with the nerve to quadratus femoris. Both muscles functions as external rotators and abductors of the hip.

The quadratus femoris muscle is the most inferior in the group of deep muscles in the gluteal region. It's a flat rectangular shaped muscle located below the obturator internus muscle. The quadratus femoris muscle originates from the rough aspect on the the lateral side of the ischium just anterior to the ischial tuberosity and it's inserted at the quadrate tubercle on the intertrochanteric crest. Quadratus femoris is also an external rotator and is innervated by the nerve to quadratus femoris.

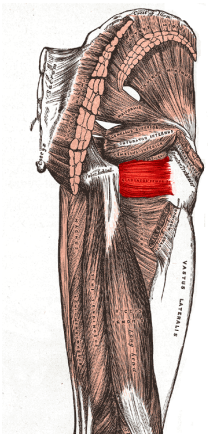

Fig. 2.14 Quadratus femoris. (Gray 1918)

Superficial group

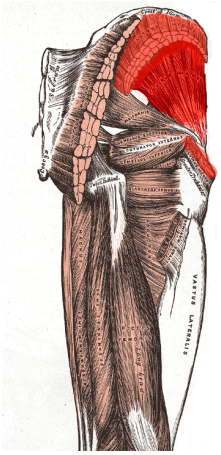

Fig. 2.15 Gluteus minimus and medius. (Gray 1918)

Gluteus minimus and medius are two of the muscles of the superficial group of the muscles in the gluteal region. Gluteus minimus is a fan-shaped muscle that originates from the external surface of the upper part of ilium. The muscle fibers narrows in and form a tendon that inserts on the anterolateral aspect of the greater trochanter.

The gluteus medius lies over the gluteus minimus and is also fan-shaped in the same way as gluteus minimus. It has a broad origin along the external surface of the iliac crest from the anterior gluteal line and posterior gluteal line and inserts on the lateral surface of the greater trochanter.

Both the gluteus medius and the gluteus minimus is innervated by the superior gluteal nerve. Their action is to abduct the lower extremity and reduce pelvic drop in the swingphase of the opposite extremity during gait by securing the position of the pelvis in the one

stance phase.

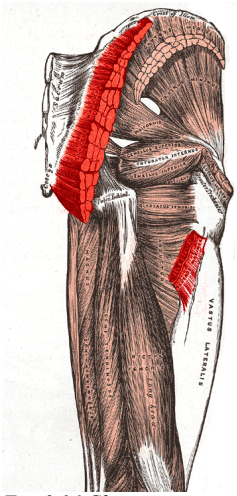

Fig. 2.16 Gluteus maximus. (Gray 1918)

Gluteus maximus is the largest muscle in the gluteal region and lies over most of the other gluteal muscles. It has a quadrangular shape and has a broad origin from the posterior half of the iliac crest along the dorsal surface of the lower sacrum and the lateral surface of the coccyx to the sacrotuberous ligament. It is also attached to fascia overlying the gluteus medius, between the ilium and sacrum, to fascia covering the erector spinae muscles, and is ofter described as being inclosed with two layers of the fascia latae, which covers the thigh and gluteal region. The muscles have a broad insertion as well. Laterally the upper and superficial lower parts of the muscle inserts to the posterior aspect of the iliotibial tract which passes over the lateral surface of the leg and inserts at the lateral side of the tibia. Deep distal parts of the muscle elongate and attach to the gluteal tuberosity of the proximal femur. The gluteus maximus is an extensor of the hip and because of its insertion in the iliotibial tract is also functions as a stabilizer for the knee and hip joint. It is innervated by the inferior gluteal nerve.

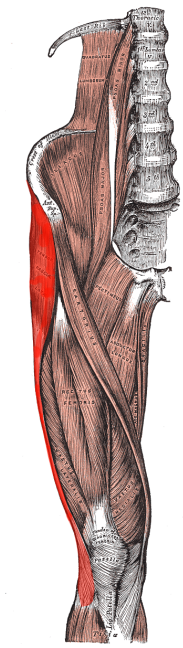

Fig. 2.17 Tensor fascia latae. (Gray 1918)

Tensor fascia latae is the most anterior muscle of the superficial muscles in the gluteal region. It originates from the outer margin of the iliac crest from the ASIS to approximately the tubercle of the crest. The muscle inserts into the iliotibial tract. Like the gluteus maximus the tensor fascia latae is inclosed in the fascia latae. And it also contributes to stabilize the knee in extension and working with the gluteus maximus in stabilizing the head of femur in the socket of acetabulum. It's innervated by the superior gluteal nerve.

Muscles of the thigh

The muscles of the thigh are arranged in three different compartments separated by a intermuscular septa.

The anterior compartment of the thigh contains sartorius and the large quadriceps muscles. All are innervated by the femoral nerve. In addition the terminal ends of psoas major and iliacus muscles pass into the upper part of the compartment. Psoas major however is innervated by branches directly from the anterior rami of L1 to L3, but iliacus is innervated by the femoral nerve.

The medial compartment of the thigh contains the six muscles gracilis, pectineus, adductor longus,

adductor brevis, adductor magnus and obturator externus. All of these except pectineus and part of the adductor magnus which is innervated by the sciatic nerve, is innervated by the obturator nerve.

The posterior compartment of the thigh contains three large muscles termed as the hamstrings. These are biceps femoris, semitendinosus and semimembranosus. They are all innervated by the sciatic nerve.

2.4 Kinesiology of the lower extremities

Both the lower extremities constitute as one common organ working in one closed mechanical chain. But they also work separately in different virtual functional chains organized in the brain. Both lower extremities can work separately oriented for a certain goal of the motion.

The purpose of the lower extremities is to support the weight of the body and enable locomotion. The hip is a mulitaxial joint that is capable of great motion as well as high loads. The mobility of the joint is compromised by its ability for weight-baring. As the hip and the pelvis servers as a fundament for the rest of the bodies alignment, good muscle balance is required in order so establish and maintain good posture (Efoke et al 1985).

Unlike the upper extremity where there is one plexus providing nerve innervation to the limb, the lower extremity is supplied by both the lumbar and sacral plexus. To be able to make a proper differential diagnosis of joint movement problems of the lower extremities, a particular attention to the different origins of nerves and the multitude of muscles is required (Weissman 1995). Many muscles cross both the hip and the knee joint making them multifunctional muscles. Distinguishing problems of tightness among these muscles can be a challenge as different problems can give rise to similar symptoms.

Because actions of the muscles of the hip joint are closely related, there can be substitution in cases of muscle weakness. The movement might function but be a result of faulty muscle usage. Failure to detect such substitutions or failure to detect them might cause faulty movement patterns, change in posture and secondary problems as a cause of it (Liebenson et al 2007).

Action:	**Muscles:**	**Action:**	**Muscles:**
Flexion of hip	Iliopsoas Pectineus Rectus femoris	Extension of hip:	Gluteus maximus Biceps femoris Semitendinosus Semimembranosus Six deep external rot.
External rotation of hip	Iliopsosas Six deep ext. rot. Gluteus medius and maximus Biceps femoris Adductor brevis and magnus	Internal rotation of hip	Gluteus minimus Semimembranosus Semitendinosus Pectineus Gracilis
Knee flexion	Semitendinosus Semimembranosus Biceps femoris Gracilis Popliteus Gastrocnemius	Knee extension	Rectus femoris Vastus medialis, intermedialis and lateralis

Fig. 2.18: Muscular action and antagonists (Drake et al., 2004)

The hip joint is a complex structure. As mentioned earlier it is a ball socket joint that moves in all planes. Ordinarily the description of a joints movement refer to the movement of the distal part in relation to a fixed proximal part. In upright weight-baring position, movement of the proximal part on the more fixed distal part is of equal importance. Therefor movements of the pelvis in relation to the femur is also included in the movements of the hip joint as well as movement of the femur in relation to the pelvis. Flexion is a movement in forward direction in the coronal plane. Traditionally this movement means bringing the thigh towards the fixed pelvis. But in this case it might also be bringing the pelvis towards the fixed thigh as in raising up from supine position, bending forward in standing position or tilting the pelvis forward as in anterior tilt in standing or lying position. There is the same way with extension. The movement of the thigh in posterior direction in the coronal plane and the movement of pelvis towards the thigh in posterior tilt. In this way one most see the hip as one complex system with forces pulling in different directions according to Newton's third law of motion; *The mutual forces of action and reaction between two bodies are equal, opposite and collinear (Newton, 1687).* This means that as the rectus femoris uses a given force to move the thigh towards the pelvis, the same force pulls the pelvis towards the thigh. So one movement cannot be isolated. It's always part of a larger muscle chain. Without understanding these muscle chains, one cannot understand the functional movements.

2.5 Biomechanics of the lower extremities

Of all the species on the earth there are only man and birds that relay on bipedal locomotion. Even larger primates use quadripedal locomotion for most of their activity. When the weight of the body is equally borne on both legs, the center of gravity is located between the two hips and the whole weight of the body, except that of the legs, are loaded on the femural heads. When the body is in a position where there is equal loading on both legs and the center of gravity is directly above the femural head in the sagital plane, no muscle activity is required to uphold this position. However in real life minimal muscle forces will be necessary to maintain balance. If the body then is leaned posteriorly the center of gravity will shift to posterior for the femural heads. This will cause the anterior hip capsule to tighten so that the stability will be produced by the big toe instead of muscles of the hip. So in symmetrical standing on both extremities the compressive forces on the hip joint is about one third of the weight of the body (Genda et al 2001).

In a single leg stance the center of gravity moves away distally away from the supporting leg as the nonsupported leg is now practically a part of the body mass acting upon the weight-baring hip. Since the muscle action moves eccentrically to the line of action of the center of gravity, the body weight will provide a turning motion around the femural head. This turning motion is a result of the forces of the abductors that are attached on the lateral side of the femur holding the limb in alignment to support the weight of the body. Involved in this motion in erect position are the upper fibers of gluteus maximus, tensor fascia latae, gluteus medius and minimus, piriformis and obturator internus. Since the lever arm of this force is considerably shorter than that of that body, as the insertion of the muscles are close to the joint relative to the length of the body, the combined forces of the abductors are mulitple that of the weight of the body. The orientation of this force pushes the femural head towards the acetabulum at approximately 16° obliquely, laterally and distally. This is about the same angle as the neck of the femurs position towards the acetabulum (Genda et al 2001).

The effect of the combined weight of the body and the abductors muscle response required for maintaining equilibrium on the femural heads are about four times the weight of the body. This means that during gait the loading on the femural head varies from zero weight-baring in swing phase to one third weight-baring in symmetrical loading two leg stance and four times weight-baring in support phase. The factors that influence the magnitude and direction of the compressive forces during gait are;

1. The position of the center of gravity
2. The abductor lever arm
3. The magnitude of body weight

If the abductor lever arm is for some reason shortened, for example because of coxa valga, the excessive femoral anteversion will result in increased abductor power demand and therefor increased joint loading. If the abductors don't have sufficient strength to provide this action, a pelvic tilt gait of trendelenburg gait will occur.

According to the three factors that influence the magnitude of the compressive forces during gait there is in physiotherapeutical rehabilitation only one factor that can be influenced in the first step. The effective loading on the hip can be significantly reduced by bringing the center of gravity closer to the center of the femural head. By the usage to crutches one does not only decrease the direct forces applied by the weight of the body, but it reduces the compressive forces by shifting the center of gravity closer to the center of the femural head. The same reduction of the compressive forces of the femural head can be achieved using a walking cain in the opposite hand. In both this ways some of the force is transferred to the cain or crutch through the hand, the effective load is reduced in two ways. The effective load of the bodyweight is reduced and the turning moment around the femural head is reduced, and thus the abductor demand is reduced.

2.6 Total hip arthroplasty; surgical procedure

Total hip arthroplasty commonly known as total hip replacement is a surgical procedure which involves replacing the femoral head and the acetabulum. Typically the artificial head of the femur is made from ceramic, the neck is made of strong metal, often titanium, and the artificial acetabulum is made of polyethylene which is a very durable plastic. The surgical procedure of total hip arthroplasty is mainly performed in the case of a traumatic fracture or severe osteoarthritis. There are several ways to perform the surgical procedure and they are named after the location of the incision in relation to the gluteus medius muscle. The procedures are: posterior (Moore), lateral (Hardinge or Liverpool), anterolateral (Watson-Jones), anterior (Smith-Petersen) and greater trochanter osteotomy(Siopack et al 1995). The one I will describe further is the anterolateral as this procedures was the one used on the patient in the case study.

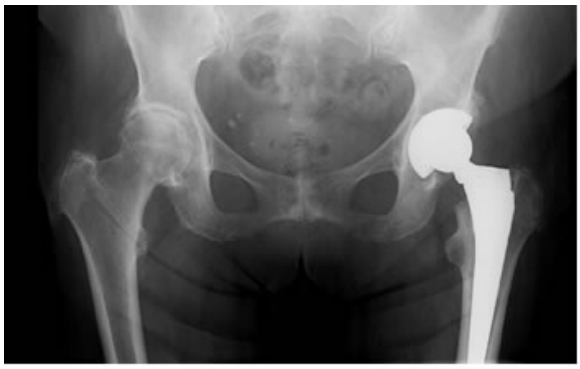

Fig. 2.18 X-ray taken after total hip arthroplasty of left hip. Anterior view.(wikipedia.org, 2012)

Before the preparations for the operation start the patient is informed about the possible risks of this kind of procedure. The common risks involve:

infection, injuries to nerves, vessels and tendons, component loosening, component perioprosthetic fractures, deep vein thrombosis, pulmonary embolisms, death, need for subsequent revision surgery, recurrent pain, recurrent limping, recurrent effusion and swelling, bleeding as well as need for blood transfusion, leg length discrepancies and dislocation of components. After the patient has agreed to go through the procedure the patient is starting the preparation for surgery.

The patient is first instructed not to eat for at least 12 hours before the surgery. Then he or she is taken to the operative suite where the appropriate hip is draped in a sterile fashion. The patent is then given anesthesia and placed in a stabile sidelying position. The incision is made laterally over the hip and carried down to the subcutaneous tissue, the tensor fascia latae and the iliotibial band. This muscle is then split in the same direction as its fibers to cause minimal injury. Protractors are then placed to expose the greater trochanter region. The gluteus medius are then cut along with the the other muscles and soft tissues connected to the greater trochanter. The femur is then put into internal and external rotation to get access to the rest of the tissues connecting proximal part of femur to the hip. When the femoral neck and head is exposed the hip is dislocated and the neck of femur is sawed approximately one finger-breadth proximal to the lesser trochanter and the femoral head is removed. The acetabulum is prepared for implantation of the prosthesis by reaming the inner surface to the appropriate size of the prosthesis. After the acetabulum is prepared the prosthesis is placed in 45° abduction and approximately 15-20° of anteversion. Then check the stability of the prosthesis with a specialized device called Cobb elevator. The preparation of the femur starts with broadening of the medullary cavity to fit the femoral prosthesis. After the broadening the prosthesis is fitted and the head placed inside the acetabular fossa. The stability is again checked in flexion, abduction and internal and external rotation before the muscles are stitched together and the operation wound closed. The patient is given anticoagulants and painkillers intravenous directly after the surgery and this is gradually reduced in amounts over the following days after the surgery.

2.7 The Rehabilitation

After the patient is done with the surgery he or she is transferred to an orthopedic intensive unit. Here the patient is under observation during the first few days after surgery. During this period the rehabilitation starts normally the day after the surgery. The patient is instructed in thromoembolic prevention, turning in the bed and verticalization. The amount of weight the patient can load the leg with is dependent on the kind for surgery that was performed. If there was a cementless method of connecting the joint replacement surfaces the patient cannot load the leg at all for the first 6 weeks

after the surgery. However, it's more common to use a cemented or hybrid, one piece cemented and one piece cementless part, in total hip replacement. In this case the patient can have partial loading on the leg straight after the surgery. But the patent will be dependent on a walker, crutches or a cain for several weeks after the surgery.

Normally the physiotherapist assist the patient in verticalization the day after the surgery along with instruction in how to walk with crutches and get from lying to standing position without endangering the operated hip. The physiotherapist will also teach the patient a few exercises that can be performed lying in bed to speed up the recovery and minimize the danger of deep vein thrombosis. Instruction in how to provide ADL's are also an important part of the rehabilitation as it's important that the patient regains independency while allowing the hip to heal. During the time of recovery there are a few movements that should be avoided as there is a danger of dislocation of the hip.

- Avoid flexion of the hip in more than 90°. This means that the patient should not sit on low chairs, beds or toilets. And not raise the knee higher than the hip or bend forward in sitting or the movement from standing to sitting. Also avoid bending forward for picking something up from the ground or tie shoes while standing.
- Avoid adduction of the hip over the midline of the body. The patient should not sit with crossed legs and be careful while getting out of the bed or out from a car not to move the leg beyond the midline.
- Avoid internal rotation of the hip. The patient should be careful while turning not to make swift movements in rotation. The toes should always point forward or slightly outwards.

After about one week the patient is moved from the intensive care unit either to go home or continue rehabilitation at a rehabilitation department or facility. Weather the patient goes home or to rehabilitation, daily exercise is important for faster recovery and reduce the danger of complications. The exercises are performed in cooperation with the physiotherapist or at home with instruction by the physiotherapist. The progress of the healing should be at least weekly monitored by the physician and physiotherapist to see that there is no complications or abnormalities.

As a physiotherapist it's essential to have a profound knowledge about the anatomy and kinesiology of the hip for treatment after total hip arthroplasty. Knowledge about the procedure and the dangers involved is also necessarily to make the correct examinations and therapy. There is, as in all patients, individual differences, but some signs are more or less universal.

The process of physiotherapeutic treatment has mainly 4 components. The first one is transfer

training, the second is gait training, the third therapeutic exercising and the forth and last is instruction in the activities of daily living. Within these components there are several considerations to be made. After the surgery the hip joint is unstable and can easily dislocate, however to obtain the range of motion, movement is important. So the therapist should always guard from dislocation of the implant but at the same time obtain free range of motion within the safe limits of the joint. Education of the patient is also necessary to make sure that the patient is aware of the dangers involved with certain movements as I have mentioned earlier. This is a part of the transfer and gait training in order to make the patient able to change positions in bed and go from lying to sitting and further to standing in a way that does not compromise the safety of the joint. This increases the freedom of movement for the patient and also has a positive psychological effect as the patient becomes more independent. But in order to further improve the independence of the patient functional strength must be restored in the muscles surrounding the joint. Weak abductors is one of the main complications after the surgery as the incision is made through them. The weakness of the abductors also results in shortness of the adductors. This limits the active range of motion both through muscle weakness and muscle shortness of the antagonistic muscles. Shortening of the hip flexors is also common, so lying with a pillow under the knees it not beneficial even though the patient might find it comfortable. This only contributes to further shortening of the muscles. Strengthening of abductors and hip extensors is essential to regain not only functional strength of the muscles but also functional length of the antagonists. PIR for stretching is also indicated as it helps to improve the range of motion. Proper gait pattern can also contribute to restore the muscle balance by instructing the patient to do extension of the hip in walking not to fall in to a Trendelenburg walking pattern with elevation of one side of the hip to compensate for lacking extension.

Walking in stairs is in most places a necessity to be able to get from one place to an other in buildings and cities. But it is also good exercise in the recovering stages after the surgery. The steps make good place to increase muscle strength and mobility of the patient. For most patients full loading of the operated leg is contraindicated so instructions on how to walk up the stair with crutches is necessary. The patient should always start with the unaffected leg when walking up stairs. Keeping both crutches on the step below until both legs are on the first step. Then move the crutches to the step the patient is standing on and repeating the process. While walking down stair the patient should start with both crutches to the step below and then move the operated leg and last the unaffected leg. Then repeat the process.

At the first stages of the therapy directly after the surgery the patient is in a state where a lot of the time is spent in static positions. Unfortunately each patient cannot have a personal physiotherapist

by their side all the time so instruction in auto-therapy is also an important part of the therapy regime. This is not only aimed at speeding up the recovery of the patient but it's also aimed to prevent potentially hazardous situations after the surgery. As the patient spend so much time in bedrest there is an increased chance of complications like pneumonia, decubitus ulcers, pulmonary embolism and thrombophlebitis. Going out of bed and get the body in motion helps to prevent most of this situations. It increases blood circulation and breathing frequency depth of the breaths. In addition to getting out of the bed several times each day, the patient should do exercises while in bed several times each day, at least every other hour. The patient should therefor be instructed in thromboembolic prevention which basically is active movement of the lower extremities in order to increase blood flow and the patients breathing frequency. The exercise consists of plantar and dorsal flexion along with pronation, supination and circumduction of the foot. The patient should also provide straight leg raise and isometric contractions of the quadriceps muscles to further increase blood flow and strengthen the muscles. Stationary bicycling in lying position is also a very good exercise to increase the breathing and blood flow of the patient, but it requires good stabilization of the pelvis and not all patients are able to provide it.

In order to make the patient more independent some kinds of aids should be used to help the patient manage the activities of daily living on their own. A pillow hard pillow should always be within the patients grasp when their in the bed. This pillow can be used as a support between the legs when shifting positions in bed or moving from lying to sitting. The pillow is placed between the legs to avoid adduction beyond the midline of the body. It can also be placed under the patients knee and work as a resistance in auto-therapy of hip extension. It's a simple tool, but it can be very handy. For the patient to be able to dress and put on shoes a shoehorn with a long handle should also be within the proximity of the bed. The patient should not bend down to put on the shoes as the hip will most likely go into over 90° of flexion, which is contraindicated. Therefor the shoes should be without laces and the shoehorn should have an appropriate length to avoid flexion of the hip over 90°. A “reacher” or “grabber” could also be given the patient so that he or she can be able to pick up things from the ground without bending forwards to much.

Most patients go home after a about a week at the hospital and there are several considerations to be made in everything from the transportation to the activities once the patient gets home. In the transportation from the facility to the home the patient should not be driving as mentioned earlier. The seats of a normal car flexes the hip over the recommended angle and the patient must therefor avoid sitting in these seats. If transportation in a normal car is the only option the patient should sit or lie lengthwise in the backseat leaning on a pillow with a pillow also between the legs to avoid adduction. If a four door car is not available the patient should sit supported on pillows with the seat

reclined as much as possible. It's only after 6-8 weeks that the patients can sit in a car or drive them self. At home the bathroom should be equipped with an elevated toilet seat and furniture that allows the patient to sit without flexion beyond 90°. The patient continues the therapy in a clinic but most of the therapy is done through auto-therapy provided by the patient in their daily routine.

3. Special part – Case study

3.1 Methodology

My practice with the patient took place at a Rheumacological hospital, Revmatologicky Ustav in Prague. From 06.02.12 till 20.02.12. The hospital is specialized on patients with rheumatological disorders often with orthopedic secondary problem. The practice is to a large degree based on conservative physiotherapy with manual therapy, soft-tissue techniques, massage and stretching and strengthening of muscles and fascia.

Many of the patients at the facility is there for state of subacute and acute postoperative rehabilitation after orthopedic surgery.

My supervisor at the facility was mrg. Maja Spiritovic, and examinations and therapeutical procedures was done in cooperation with her.

The basis of the examination and therapy was funded on the principles of Janda et. al.(2007), Kendall et. al.(2005) and Lewit (2010). It consisted of:

- Postural examination according to Kendall
- Palpation according to Lewit
- Movement patterns according to Janda
- Range of motion according to Kendall
- Joint play examination according to Lewit
- Neurological tests
- Anthropometric measurements
- Thromboembolic prevention
- Soft-tissue techniques
- PIR according to Lewit
- Strengthening techniques

My patient was informed from the beginning and the work and examinations has been approved by the Ethics Committee of the Faculty of Physical Education and Sports at Charles University, Prague.

3.2 Anamnesis

Performed 06.02.12

Name: V. B. Female

Year of birth: 1945

Height: 169 cm

Weight: 63 kg

BMI: 22,06 kg/m²

Temperature: 36,9° Celsius

BP: 100/57 mm/hg

BF: 17 c/min

CRP: 24

Diagnosis:

ICD-9: 696.0 Psoriatic Arthritis

ICD-9: 81.51 Dexter Total Hip Athroplasty (06.04.2004)

ICD-9: 81.51 Sinister Total Hip Athroplasty (23.01.2012)

Chief Complaint:

Post-operative state of left hip with weakness and deep murmuring pain of the left hip joint. Pain is present during the night and can obstruct sleep. The patient is currently on analgesics during the night. The patient has difficulties walking and performing hip abduction in the toe-off phase of gait.

On a pain scale from 1-10 the pain differs from 3-7 according to the patient. In addition to the post-operative difficulties, the patient suffers from psoriatic arthritis. This means that the patient have pain in metacarpophalangial joint especially in low pressure weather. There are limitations of strength of the grip and ROM in opposition of the 1st and 5th finger.

History of present problem:

12 years ago she was on vacation in Thailand. During the stay she got severe swelling of the knee and a painful hematoma on the right hip . The knee and the hip was painful and reduced in ROM. When she got back to Czech Republic she went to her physician for examination and got diagnosed with psoriatic arthritis. She went into immediate therapy with corticoid steroids to reduce swelling and inflammation. After that she's had gradual degeneration of metatarsophalageal joints and the metacarpophalangeal joints along with both hips, knees and shoulders.

Psychosocial history:

Work: She currently work with trading of arts. She has a small company that sells art. Mainly paintings.

Hobbies: Reading, painting, arts and traveling. She likes to go swimming and does so about 1-2 times a week.

Living conditions: She is currently living alone in a 5th floor apartment in a building complex. The building has an elevator and there are no stairs in the apartment.

Social status: Unmarried

Children: None

Pets: One cat.

Associated problems: The patient manages most ADL's herself, but had some pain in the joints during hard labor. The patient has not been home since the surgery.

Personal and medical history:

Diseases:

- Bilateral glaucoma

- Anemia in y. 1/2004-8/2004
- Sinister slight sensitive deficit of n. ulnaris
- Dexter distal slight sensory deficit of n. radialis
- Occasional migraine

Operations:

- Thyriedectomy in y. 1984
- Dexter Total hip Athroplasty in y. 2004
- Sinister Elbow Synovectomy in y. 2008

Gynecological:

- Spontaneous abortion, the year is not documented
- Menopause at the age of 49

Family history:

Father: No history of rheumatoid disease. Died from heart failure at about 80 years old.

Mother: Also suffered from psoriatic arthritis. Died from cancer at old age.

Sister: No signs of any rheumatological disease.

Pharmacological:

- Letrox 100mg, 1-0-0: Synthetic thyroid hormone
- Duotrav: eyedrops that decrease interocular hypertension
- Clexan 0,4ml, 0-0-1: anticoagulant used for prevention of deep vein thrombosis

Abuses:

Smoking: No

Alcohol: Occasionally, normal consumption

Other: None

Previous rehabilitation:

The patient had rehabilitation immediately after she was diagnosed. After that she's had regular therapy. Mostly she's been having traditional therapy with manual therapy, strengthening and passive movement of affected joints. The effect of the therapy is hard to determine due to the nature of the disease. Subjectively the patient has a positive impression of the therapy and often feels better after a therapy session.

Health documentation extract:

The patient was diagnosed in year 2000. She came to her physician with pain and swelling in the left knee. There was recorded no other complaints at that stage.

Indication to rehabilitation:

N/A

Differential diagnosis:

As the patient has undergone total hip athroplasty, any further differential diagnosis is redundant. However, the patient should be tested for any neurological deficit as a result of the surgery before the therapy starts.

3.3 Initial Kinesiological Examination

Examination was performed 09.02.12

3.3.1 Aspection:

The skin has signs of longer periods of use of corticosteroid and looks thin and dry. Deformation of metatarsophalangeal joints with hallux valgus on both feet. Slight deformation of the digits with signs of boutonniere deformity. Wound from the operation is without complications and there is no apparent swelling on either extremities. The actual scar is covered by a plaster, but there is no apparent discoloration or swelling.

3.3.2 Postural Examination according to Kendall:

Reduced weight-bearing on sinister leg.

Posterior:

- Prominence of dexter achilles tendon
- Brachioradial triangle bigger on left side
- Dexter convex in lumbar and lower thoracic spine
- Sinister convex upper thoracic and cervical spine
- Slight winged scapula most on right side
- Elevation of right shoulder
- Symmetrical and balanced head position. No tilt or rotation.

Lateral Dexter:

- Ankle in neutral position
- Knee locked in extension
- Hip in neutral position
- Slight hyperlordosis of lumbar spine
- Slight hyperkyphosis of thoracic spine

- Forward head position
- Counterclockwise rotation of trunk
- Semiflexion of elbow
- Protraction of dexter shoulder

Lateral Sinister:

- Ankle in slight plantar flexion
- Semiflexion of knee
- Semiflexion of hip
- Slight hyperlordosis of lumbar spine
- Slight hyperkyphosis of thoracic spine
- Forward head position
- Semiflexion of elbow
- Slight protraction of shoulder

Anterior:

- Curled toes in flexion about 40°
- External rotation of feet.
- Deformation of toes with toe plantar flexion
- External rotation of knees
- Semiflexion of hip
- Abdominal curvature larger on left side
- Higher elevation of right shoulder.
- Symmetrical and balanced head position. No tilt or rotation.

Pelvis examination:

- Crista iliaca: 1,5 cm higher on sinister side

- Anterior superior iliac spine: 1,5 cm higher on sinister side
- Posterior superior iliac spine: 1,5 cm higher on sinister side

3.3.3. Palpation:

Lower extremities:

Muscle:	**Left:**	**Right:**
Plantar aponeurosis	Normal tone	Hypertone
Triceps surae	Hypertone	Hypertone
Dorsal flexors of foot	Normal tone	Hypertone
Adductors of hip	Hypertone	Normal tone
Rectus femoris	Hypertone	Normal tone
Vastus medialis/intermedialis/lateralis	Hypertone	Slight hypertone
Abductors of hip	Hypertone	Normal tone
Hamstrings	Hypertone	Normal tone
Gluteals	Hypotone	Hypotone
Piriformis	Hypertone with TP	Hypertone

Fig 3.3.1: Lower extremity palpation

Upper Thorax

Muscle:	**Left:**	**Right:**
Latissimus Dorsi	Normal tone	Normal tone
Lower and Middle Trapezius	Normal tone	Normal tone
Teres major	Normal tone with TP	Normal tone with TP
Infraspinatus	Normal tone with TP	Normal tone
Supraspinatus	Hypertone	Normal tone
Upper trapezius	Hypertone	Hypertone
Deltoid	Hypertone	Hypertone
Pectoralis minor	Hypertone with TP	Hypertone
Subscapularis	Hypertone with TP	Hypertone with TP

Fig. 3.3.2: Upper trunk palpation

3.3.4. Movement patterns according to Janda:

Dexter Hip Extension:

- Contraction of ipsilateral erector spinae before contraction of gluteus maximus.
- Movement of pelvis in compensation of weakness of gluteus maximus.

Sinister Hip Extension:

- Contraction of ipsilateral erector spinae before contraction of gluteus maximus.
- Movement of pelvis in compensation of weakness of gluteus maximus.
- Not able to move the joint in the full ROM due to weakness of gluteus maximus and instability of the joint.

Dexter Hip ABD: performed in prone position as patient cannot lie on operated side.

- Activation of tensor fascia latae before gluteus medius.
- Partially compensation movement with quadratus lumborum.
- Increasing lumbar lordosis by activation of quadratus lumborum and erector spinae.

Sinister Hip ABD: with pillow between the legs to avoid ADD over midline of the body.

- Activation of quadratus lumborum in initiation of the movement.
- Weakness of gluteus medius and tensor fascia latae prevents the patient to move through the full ROM. Only about 20° movement.

Neck Flexion:

- Movement mainly into protraction.
- Is able to hold the position with some tremor at the end.
- Not comfortable for the patient.

Trunk Flexion:

- The patient is not able to perform the movement without use of hip flexors.
- Moves in influent movement and not through the full ROM due to contraindication of flexion in the hip.

Dexter Shoulder ABD:

- Initiate movement with elevation of shoulder through activation of upper trapezius muscle.
- Activation of quadratus lumborum, but without lateral flexion.

Sinister Shoulder ABD:

- Initiate movement with elevation of shoulder through activation of upper trapezius muscle.
- Activation of quadratus lumborum, but without lateral flexion.

Push-up: Performed static on knees and elbows.

- Alata scapula with ADD on both sides due to weakness of serratus anterior. More on sinister side than dexter.

3.3.5. Range of motion Examinations:

Direction:	Left; active	Right; active	Left; passive	Right; passive
Upper extremity: Shoulder				
Flexion (180°)	160	160	170	170
Extension (50°)	40	40	45	45
Abduction (180°)	170	170	180	180
Adduction (30°)	20	20	30	30
Int. rotation (90°)	90	90	90	90
Ext. rotation (80°)	70	70	75	75
Upper extremity: Elbow				
Flexion (150°)	135	120	140	130
Extension (0°)	30	30	-30	-30
Supination (90°)	50	50	50	50
Pronation (90°)	60	60	60	60
Upper extremity: Wrist				
Flexion (80°)	70	70	80	80
Extension (70°)	50	50	60	60
Ulnar duction (30°)	20	20	25	25
Radial duction (20°)	10	10	10	10
Lower extremity: Hip				
Flexion (120°) **flexed knee**	N/A	100	N/A	110
Flexion (90°) **extended knee**	40	70	50	80
Extension (30°)	5	10	15	20
Abduction (50°)	20	35	20	40
Adduction (30°)	N/A	10	N/A	20
Int. rotation (40°)	N/A	20	N/A	30
Ext. rotation (50°)	N/A	30	N/A	40
Lower extremity: Knee				
Flexion (150°)	90	130	100	130
Extension (0°)	0	0	0	0

Lower extremity: Ankle				
Plantarflexion (40°)	30	40	30	40
Dorsiflexion (20°)	0	10	10	10
Inversion (20°)	0	0	0	0
Eversion (10°)	0	0	0	0

Fig. 3.3.3: ROM according to Kendall

3.3.6. Neurological Examination

Superficial sensation:

Sensory dermatome and associated nerves:	**Left:**	**Right:**
L1 – Iliohypogastric, Ilioinguinal, Genitofemoral, Dorsal rami of L1-3	Physiological to light touch throughout the dermatome	Physiological to light touch throughout the dermatome
L2 – Obturator, Anterior femoral cutaneous, Genitofemoral, Lateral femoral cutaneous, Dorsal rami of L1-3	Physiological to light touch throughout the dermatome	Physiological to light touch throughout the dermatome
L3 – Obturator, Anterior femoral cutaneous, Saphenous.	Dysesthesia anteromedial below knee joint.	Physiological to light toutch throughout the dermatome
L4 – Saphenous, Lateral cutaneous of calf, Superficial peronea.	Dysesthesia anteromedial below knee joint.	Physiological to light toutch throughout the dermatome
L5 – Superficial peroneal, Lateral cutaneous of calf, Deep peroneal.	Physiological to light toutch throughout the dermatome	Physiological to light toutch throughout the dermatome

S1 – Dorsal rami of S1-3, Posterior femoral cutaneous, Superficial peroneal, Lateral cutaneous of calf, Sural, Calcaneal, Medial plantar, Lateral plantar	Physiological to light toutch throughout the dermatome	Physiological to light toutch throughout the dermatome

Fig. 3.3.4: Superficial sensation.

Proprioception:

- Heel from knee to first toe: Normal, only performed with right leg as to avoid rotation in the hip
- Position test: The patient was able to copy the position of both legs and distinguish movement of the limb.

Tendon Reflexes:

Tendon relex (innervation):	**Left:**	**Right:**
Patellar reflex (L4):	2+ (slight hyporeflex)	3 (physiological)
Hamsting reflex (L5):	2 (hyporeflex)	2+ (slight hyporeflex)
Achilles reflex (S1):	2 (hyporeflex)	3 (physiological)
Plantar reflex (S1):	3 (physiological)	3 (physiological)

Fig. 3.3.5: Tendon reflexes

  - The decrease in tendon reflex response might be caused by the patients unability to relax. After several attempts there was improvement of the response.

Pathological signs:

- Babinski: Negative on both sides.

Motor function:

Muscle and associated nerve:	**Left:**	**Right:**
Tibialis anterior (L4, L5) – deep peroneal.	Normal function.	Normal function.
Extensor hallucis longus (L4, L5, S1) – deep peroneal.	Normal function.	Normal function.
Peroneus longus (L5, S1) – superficial peroneal	Normal function.	Normal function.

Fig. 3.3.6: Neurological motor function

3.3.7. Joint Play according to Lewit					
Joint/Exam.	**1st Digit**	**2nd Digit**	**3rd Digit**	**4th Digit**	**5th Digit**
Dex. Dist. IP: Dorsal	Restricted	Restricted	Restricted	Restricted	Restricted
Sin. Dist. IP: Dorsal	Restricted	Restricted	Restricted	Restricted	Restricted
Dex. Dist. IP: Plantar	Restricted	Restricted	Restricted	Restricted	Restricted
Sin. Dist. IP: Plantar	Restricted	Restricted	Restricted	Restricted	Restricted
Dex. Dist. IP: Lateral	Restricted	Restricted	Restricted	Restricted	Restricted
Sin. Dist. IP: Lateral	Restricted	Restricted	Restricted	Restricted	Restricted
Dex. Prox. IP: Dorsal	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Dorsal	Restricted	No restriction	No restriction	No restriction	No restriction
Dex. Prox. IP: Plantar	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Plantar	Restricted	No restriction	No restriction	No restriction	No restriction

Dex. Prox. IP: Lateral	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Lateral	Restricted	No restriction	No restriction	No restriction	No restriction
Dex. MTP: Dorsal	Restricted	Restricted	Restricted	Restricted	Restricted
Sin. MTP: Dorsal	Restricted	Restricted	Restricted	Restricted	Restricted
Dex. MTP: Plantar	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. MTP: Plantar	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. MTP: Lateral	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. MTP: Lateral	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. MTP: Rotation	No restriction				
Sin. MTP: Rotation	No restriction				
Dex. MT heads: Dorsal	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. MT heads: Dorsal	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. MT heads: Plantar	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. MT heads: Plantar	No restriction	No restriction	No restriction	No restriction	No restriction

Fig. 3.3.7: Joint play examination of lower extremities

Joint:	Dorsal:	Plantar/Ventral:	Rotation: (int./ext.)	Lateral:
Dex. Lisfranc	No restriction	No restriction	No restriction	
Sin. Lisfranc	No restriction	No restriction	No restriction	
Dex. Cuboid	No restriction	No restriction		
Sin. Cuboid	No restriction	No restriction		
Dex. Naviculare	No restriction	No restriction		
Sin. Naviculare	No restriction	No restriction		
Dex. Calcaneus				No restriction
Sin. Calcaneus				No restriction
Dex. Tallocrural	No restriction			
Sin. Tallocrural	No restriction			
Dex. Knee	No restriction	No restriction		No restriction
Sin. Knee	No restriction	No restriction		No restriction
Dex. Tibiofibular			No rest./No rest.	
Sin. Tibiofibular			No rest./No rest.	
Dex. Head of fibula	No restriction	No restriction		
Sin. Head of fibula	Blockage	Blockage		

Joint:	Cranial:	Caudal:	Rotation:	Lateral:
Dex. Patella	No restriction	No restriction		No restriction
Sin. Patella	Restricted	Restricted		Restricted

Joint:	Ventral:	Dorsal:	Rotation:	Lateral:
Dex. Lower SI	Restricted	Restricted		
Sin. Lower SI	Restricted	Restricted		
Dex. Upper SI	Restricted	Restricted		
Sin. Upper SI	Restricted	Restricted		
Lumbar spine	No restriction		No restriction	
Thoracic spine	No restriction		No restriction	
Cervico-thoracic	No restriction		No restriction	
C2-C3	No restriction	No restriction	Restricted	
Dex. SC	No restriction	No restriction		
Sin. SC	No restriction	No restriction		
Dex. AC	No restriction	No restriction		
Sin. AC	No restriction	No restriction		

Joint:	Ventral	Dorsal:	Caudal:	Lateral:
Dex. Shoulder	No restriction	No restriction	No restriction	No restriction
Sin. Shoulder	No restriction	No restriction	No restriction	No restriction
Dex. Elbow				No restriction
Sin. Elbow				No restriction
Dex. Head of radius	Restricted	Restricted		
Sin. Head of radius	No restriction	No restriction		
Dex. Radioulnar	No restriction	No restriction		
Sin. Radioulnar	No restriction	No restriction		
Dex. Radiocarpal	No restriction			No restriction
Sin. Radiocarpal	No restriction			No restriction
Dex. Prox. Carpal	No restriction	No restriction		
Sin. Prox. Carpal	No restriction	No restriction		
Dex. Dist. Carpal	No restriction	No restriction		
Sin. Dist. Carpal	No restriction	No restriction		
Dex. Pisiform			No restriction	No restriction
Sin. Pisiform			No restriction	No restriction
Dex. Schapoid	No restriction	No restriction		
Sin. Schapoid	No restriction	No restriction		
Dex. Capitate	No restriction	No restriction		
Sin. Capitate	No restriction	No restriction		

Fig. 3.3.8: Joint play examination

Joint/exam:	**1st Digit**	**2nd Digit**	**3rd Digit**	**4th Digit**	**5th Digit**
Dex. Dist. IP: Dorsal	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. Dist. IP: Dorsal	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. Dist. IP: Palmar	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. Dist. IP: Palamar	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. Dist. IP: Lateral	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. Dist. IP: Lateral	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. Prox. IP: Dorsal		No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Dorsal		No restriction	No restriction	Restricted	No restriction
Dex. Prox. IP: Palmar		No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Palmar		No restriction	No restriction	Restricted	No restriction
Dex. Prox. IP: Lateral		No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Lateral		No restriction	No restriction	Restricted	No restriction
Dex. MCP: Dorsal	Restricted	No restriction	No restriction	No restriction	No restriction

Sin. MCP: Dorsal	No restriction	No restriction	No restriction	Restricted	No restriction
Dex. MCP: Palmar	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. MCP: Palmar	No restriction	No restriction	No restriction	Restricted	No restriction
Dex. MCP: Lateral	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. MCP: Lateral	No restriction	No restriction	No restriction	Restricted	No restriction
Dex. MCP: Rotation	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. MCP: Rotation	No restriction	No restriction	No restriction	Restricted	No restriction
Dex. MC heads: Dorsal	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. MC heads: Dorsal	No restriction	No restriction	Restricted	Restricted	Restricted
Dex. MC heads: Palmar	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. MC heads: Palmar	No restriction	No restriction	Restricted	Restricted	Restricted

Fig. 3.3.9: Joint play examination upper extremities

3.3.8. Anthropometric measurements:

Lower extremities:	**Sinister:**	**Dexter:**
Anatomical Length	86 cm	84 cm
Functional Length	93,5 cm	91,5 cm
Thigh	41 cm	39 cm
Circumference thigh	51 cm	48 cm
Circumference knee	35 cm	35 cm
Circumference calf	31 cm	32 cm
Circumference ankle	21 cm	20 cm

Fig. 3.3.10: Anthropometric measurements

3.3.9. Conclusion

In the postural examination there was some findings indication a muscular imbalance as well as uneven weight baring on the lower extremities as there was more protrusion of the right achilles tendon. As the patient is only two weeks after surgery full weight baring on the operated leg is contraindicated so a scale test would be redundant as differentiation in weight baring is expected. But the curvature of the spine suggests uneven weight baring over some time. It could be a result of a protective mechanism due to pain in the hip joint. As there is no traumatic injury that was cause for the surgery one can expect that the patient has been struggling with pain from osteoarthritis of the hip joint for some time and adapted to protective, analgesic movement patterns to avid stress and strain on the joint. A common protective measure to avoid strain on the hip is over activation of quadratus lumborum to compensate for reduced movement in the hip joint in gait. A shortening of the left quadratus lumborum will in second turn result in a right sided convexity of the lumbar spine as the lower ribs are pulled towards the iliac crest. To compensate for the right side convexity of the lumbar spine the thoracic and lower cervical spine shift to a left side convexity to maintain the center of gravity.

The results from the neurological examinations are somewhat unclear. There was a finding of dysesthesia at the anteromedial side below the patella on the left leg. This suggests some kind of neurological deficit which could be a result of trauma during the surgery. Together with the findings of reduced tendon reflexes it could be signs of neural injury. However the from the motor function test and proprioceptive tests there was no signs of neural damage. And the tendon reflexes could be inhibited by the patients inability to relax the muscles of the area concerned.

The basic movement patterns support the theory of muscle imbalance. The movement was supported by compensatory movement patterns with contraction of the erector spinae in hip extension and late activation of gluteus maximus. I could also have preformed manual muscle testing according to Kendall to further examine sights of muscle weakness. But as the basic movement patterns provided me with the most necessary information I did not prioritize it because it is relatively time consuming and involves extra strain on the patient. So due to the lack of time and the condition of the patient I choose not to perform specific manual muscle testing, but got a general idea on what needed strengthening from the movement pattern test and strengthening exercises done after the examination.

There was also obvious limitation in the ROM especially in ABD and extension seen both in basic movement pattens and ROM test. This would limit the gait pattern and contribute to a faulty pattern of gait and in second extent faulty posture. It's expected in a patient with this kind of surgery to find

these kinds of limitation and stretching PIR and strengthening will therefor be one of the main focuses of the therapy in the following days.

Another problem for this patient is the limitations in joint play. This might be caused by the psoriatic arthritis, but I will even so use manual methods as a central part of the treatment.

3.4 Physiotherapeutic Plan

3.4.1. Goal of therapy

The goal of the therapy is to restore the function of the affected leg and make the patient independent in the activities of daily living. Some of the therapy will also be focused on prevention of further degeneration of the other affected joints.

3.4.2. Short term Physiotherapeutic Plan

- Increase muscles strength of the lower extremities especially the affected limb.
- Increase joint play by manual techniques
- Decrease hypertone in muscles of upper thorax and thigh by PIR and STT
- Improve gait patterns
- Increase the rate of the healing by scar therapy.
- Educate in proper posture and movement patterns
- Educate in usage of crutches

3.4.3. Long term Physiotherapeutic Plan

- Increase deep stabilization of trunk and pelvis by breathing and core strengthening.
- Increase strength of lower extremities by redcord and over ball exercises.
- Decrease faulty posture by strengthening with terrabands and sensomotoric exercises.
- Increase ROM in the hip by PIR and antagonist strengthening.

3.5 Therapy Progress

Day to day therapy

Date: 06.02.2012 Time: 10.30-11.30

Status:

Subjective: The patient was feeling tired. She claims she is not able to sleep well because it's a new place and she's not used to sharing room with other patients in addition to pain in the hip joint during the night. She describes the pain as dull and murmuring.

Objective: Patient has limitation in strength of the operated hip joint. Some of the limitation is due to weakness but pain is also a contributing factor.

Objective of today: Since it was the first meeting with the patient a lot of time was spent on examination and mapping up the patients motivation and boundaries. Because the patient was already tired there was almost no time or energy for therapy this session. I did however provide therapy within the limitation of the patient.

Therapy proposal: According to the findings in the initial examination the first thing that should be addressed is rehabilitation of the operated hip.

Therapy suggestions: According to the initial kinesiological examination and prior knowledge of patients with total athroplasty the therapy session is going to be focused on STT of lower extremities and lower back, stretching of short muscles of the hip and calf and strengthening of muscles of hip and pelvis stabilization.

Therapy execution:

1. Instruction and exercise of thromboembolic prevention. By movement of foot in plantar- and dorsiflexion as well as inversion, eversion and circulatory movement. Using the the fibularis longus and brevis for plantar flexion and eversion, the tibialis anterior for dorsiflexion and inversion, extensor hallucis longus for dorsiflexion and both inversion and eversion, extensor digitorum longus and fibularis tertius for dorsiflexion and eversion, the triceps surae for plantar flexion, flexor hallucis longus, tibialis posterior and flexor digitorum longus for plantar flexion and inversion.
2. STT in cranial and transverse direction of lower extremities and lower back. Both skin, fascia and muscles. fascia was treated perpendicular to the underlying muscle fibers.

Muscles however was treated in same direction as the fibers of the muscles mostly in cranial direction to increase blood flow and lead to a more rapid healing process along with relaxation of the muscles.

3. PIR of triceps surae: 3 rounds of inhaling with minor contraction followed by exhalation and relaxation of the muscle. Applied in supine position according to Lewit.
4. PIR of quadriceps femoris: 3 rounds of inhaling with minor contraction followed by exhalation and relaxation of the muscle. Applied in prone position based on principles by Lewit and Kendall
5. PIR of ADD of hip: 3 rounds of inhaling with minor contraction followed by exhalation and relaxation of the muscle. Applied in supine lying position according to Lewit.
6. PIR of quadratus lumborum: 3 rounds of inhaling with minor contraction followed by exhalation and relaxation of the muscle. Applied in sitting position according to Lewit.
7. Passive movement of hip in flexion using manual contact on dorsal side of the knee and the ankle, moving the leg in 80° flexion and back into 0°. Repeated the movement about 10-15 times on affected leg.
8. Passive movement of the hip in abduction using manual contact on the posterolateral side of the knee and postromedial side of the ankle moving the leg in full range of motion in hip abduction and back to neutral position. Repeated the movement about 10-15 times on affected leg.
9. Active isotonic movement in flexion of the hip using manual contact on the anterior side of the lower thigh and the ankle holding the foot barely over the surface of the bench to reduce friction. Providing small resistance on the lower thigh within the boundaries of the patient allowing isotonic movement in flexion to about 70-80°. Repeated 12x2 times on both legs.
10. Active isotonic movement in abduction of the hip using manual contact on the posterolateral side of the thigh and the posteromedial side of ankle holding the foot barely over the surface to reduce friction. Providing small resistance to the lateral side of the thigh within the boundaries of the patient allowing isotonic movement throughout the full range of motion of the hip in abduction. Repeated 12x2 times on affected leg.
11. Isometric strengthening of hip in extension using over-ball. The patient was still in supine position with the affected leg in slight flexion of the hip and knee. The over-ball was under the patient's knee. The patient pressed the knee down towards the ball providing isometric contraction of the hip extensors. It's emphasized that the patient is doing correct contraction

of the gluteus maximus and abdominal muscles providing proper stabilization of pelvis during the contraction. Provided 12x2 times on the affected leg.

12. Glut-bridge with rhytmic stabilization. Provided with the patient the patient in supine position with flexion of hip and knee. The patient raise the hip from the table in an isotonic movement where the patient holds the position in an isometric contraction. Small resistance was provided to the hip in multiple directions for isometric strengthening of gluteal muscles, abdominals and general pelvic stabilizers. The patient held the position for about 10 seconds before relaxing for about 15-20 seconds and repeating the movement 4 times.

Self therapy: Patient is instructed in thromboembolic prevention and active movement of the hip. But avoid internal rotation flexion over 90° and movement beyond the midline of the body in adduction.

Conclusion of todays therapeutical unit: The patient is obviously tired, but has a lot of motivation to get well as soon as possible. The patient has a relatively high tolerance of pain, but can maybe push herself to far and fall into a faulty movement pattern during the exercises.

Date: 07.02.12 Time: 13.00-13-30

Status:

Subjective: The patient had another night with little sleep. Today she feels more tired than yesterday. She starting to feel some pain at the posterior side of the knee joint during the night that kept her from sleeping. There is also a haematoma on the posterior side of the knee. As a result of the lack of energy the movement patterns are also worse than on the initial kinesiological examination.

Objective: The state of the patient might be partially caused by the weather. It was cloudy and snowing that day. Low pressure weather conditions are known to affect patients with joint disorders and cause discomfort and pain. The worsening of the movement patterns does not necessarily indicate an actual decline in the patient's condition. I might be circumstantial due to lack of sleep and energy.

Objective of today's therapeutical unit: Due to the patients state this particular day there is not as much benefit from hard strengthening.

Therapy proposal: To days therapeutic unit will mainly be focused on increasing ROM and joint play using manual methods. Active and passive movement in hip joint might be useful to prevent further shortening of already short muscles surrounding the joint. thromboembolic prevention

should be applied as the patient is tired and will most likely stay relatively passive the rest of the day.

Therapy execution:

1. Exercise of thromboembolic prevention. By movement of foot in plantar- and dorsiflexion as well as inversion, eversion and circulatory movement. Using the the fibularis longus and brevis for plantar flexion and eversion, the tibialis anterior for dorsiflexion and inversion, extensor hallucis longus for dorsiflexion and both inversion and eversion, extensor digitorum longus and fibularis tertius for dorsiflexion and eversion, the triceps surae for plantar flexion, flexor hallucis longus, tibialis posterior and flexor digitorum longus for plantar flexion and inversion.
2. STT in cranial and transverse direction of lower extremities and lower back. Both skin, fascia and muscles. fascia was treated perpendicular to the underlying muscle fibers. Muscles however was treated in same direction as the fibers of the muscles mostly in cranial direction to increase blood flow and lead to a more rapid healing process along with relaxation of the muscles.
3. Scar therapy around the operation wound without going past the boarder of the plaster. STT of the tissues around the scar in cranial direction focusing on the subcutaneous tissue and fascia.
4. Passive movement in ABD of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the medial surface of the patients calf. The other hand fixate the pelvis to avoid tilt during the movement. The movement was made though the full range of motion about 15-20 times.
5. Passive movement in flexion of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my contralateral hand was placed under the patients knee and the ipsilateral hand on the anterior side of the patients ankle. The movement was made by me in flexion of the knee and the hip in about 70-80°. The movement was repeated about 15-20 times.
6. Active isotonic movement in ABD of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the

table. The manual contact of my ipsilateral hand was on the lateral surface of the patients knee. The other hand fixate the pelvis to avoid tilt during the movement. The movement was made though the full range of motion against slight restriction given in medial direction by my ipsilateral hand. The movement was made 12x2 times.

7. Active isotonic movement in flexion of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my contralateral hand was placed on the anterior surface of the lower thigh and the ipsilateral hand on the anterior side of the patients ankle. The movement was made in flexion of the knee and the hip in about 70-80° with slight resistance against the anterior side of the thigh. The movement was repeated 12x2 times.
8. PIR of ADD of hip using red-cord/therapy master based on principles of Lewit. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the medial surface of the patients knee. The other hand fixate the pelvis to avoid tilt during the movement. The leg is moved in full abduction. 3 rounds of inhaling with minor contraction in adduction followed by exhalation and relaxation of the muscle slight pressure in abduction was made as the patient relaxed. The process was repeated 3 times.
9. Isometric strengthening of hip in extension using over-ball. The patient was still in supine position with the affected leg in slight flexion of the hip and knee. The over-ball was under the patients knee. The patient pressed the knee down towards the ball providing isometric contraction of the hip extensors. It's emphasized that the patient is doing correct contraction of the gluteus maximus and abdominal muscles providing proper stabilization of pelvis during the contraction. Provided 12x2 times on the affected leg.
10. Mobilization of toes, lisfranc, tallocrural and knee joint according to Lewit
11. Mobilization of fingers, wrist and radioulnar joint according to Lewit

Conclusion: Todays therapeutic unit was not so physically demanding for the patient. The pain in the knee joint was decreased during the STT and vanished during the passive movements. The patient felt more fatigued after the session but had less discomfort. The ROM in ABD of the hip seemed to have increased from the initial kinesiological examination. The weakness of the muscles surrounding the hip and knee are yet to be addressed in another session.

Date: 08.02.12 Time: 09.00-09.30

Status:

Subjective: The patient has slept well all night and feels rested and good. She has no pain either in the hip or the knee. She moves more easily than yesterday and feels a lot stronger.

Objective: The patient moves in a better way and looks healthier. There are not as much compensatory movement with the quadratus lumborum in the walking with the crutches. She has a better posture in sitting and moves with more energy and speed.

Objective of todays therapeutic unit: Strengthening of weak muscles surrounding the hip joint and core muscles of the trunk to improve position and stability of pelvis. Increase ROM and loosen hypertonic muscles.

Therapy proposal: Continue work on the ROM and stretching of shortened muscles. Strengthening of muscles surrounding the hip and knee along with core muscles of the trunk for stabilization of pelvis. STT and on hypertonic skin, fascia and muscles. Trigger point therapy of trigger points in the upper part of thorax. Also manual methods with soft mobilization of major and small joints of hands and feet.

Therapy execution:

1. Exercise of thromboembolic prevention. By movement of foot in plantar- and dorsiflexion as well as inversion, eversion and circulatory movement. Using the the fibularis longus and brevis for plantar flexion and eversion, the tibialis anterior for dorsiflexion and inversion, extensor hallucis longus for dorsiflexion and both inversion and eversion, extensor digitorum longus and fibularis tertius for dorsiflexion and eversion, the triceps surae for plantar flexion, flexor hallucis longus, tibialis posterior and flexor digitorum longus for plantar flexion and inversion.
2. STT in cranial and transverse direction of lower extremities and lower back. Both skin, fascia and muscles. fascia was treated perpendicular to the underlying muscle fibers. Muscles however was treated in same direction as the fibers of the muscles mostly in cranial direction to increase blood flow and lead to a more rapid healing process along with relaxation of the muscles.
3. Scar therapy around the operation wound without going past the boarder of the plaster. STT of the tissues around the scar in cranial direction focusing on the subcutaneous tissue and fascia.
4. Passive movement in ABD of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The

manual contact of my ipsilateral hand was on the medial surface of the patients calf. The other hand fixate the pelvis to avoid tilt during the movement. The movement was made though the full range of motion about 15-20 times.

5. Passive movement in flexion of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my contralateral hand was placed under the patients knee and the ipsilateral hand on the anterior side of the patients ankle. The movement was made by me in flexion of the knee and the hip in about 70-80°. The movement was repeated about 15-20 times.
6. Active isotonic movement in ABD of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the lateral surface of the patients knee. The other hand fixate the pelvis to avoid tilt during the movement. The movement was made though the full range of motion against slight restriction given in medial direction by my ipsilateral hand. The movement was made 12x2 times.
7. Active isotonic movement in flexion of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my contralateral hand was placed on the anterior surface of the lower thigh and the ipsilateral hand on the anterior side of the patients ankle. The movement was made in flexion of the knee and the hip in about 70-80° with slight resistance against the anterior side of the thigh. The movement was repeated 12x2 times.
8. Active isotonic movement in ABD of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the lateral surface of the patients knee. The other hand fixate the pelvis to avoid tilt during the movement. The movement was made though the full range of motion against slight restriction given in medial direction by my ipsilateral hand. The movement was made 12x2 times.
9. Active isotonic movement in flexion of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my contralateral hand was placed on the anterior surface of the lower thigh and the ipsilateral hand on the anterior side of the patients ankle. The movement was made in flexion of the knee and the hip in about 70-80° with slight resistance against the anterior side of the thigh. The movement was repeated 12x2 times.

10. Isometric strengthening of hip in extension using over-ball. The patient was still in supine position with the affected leg in slight flexion of the hip and knee. The over-ball was under the patient's knee. The patient pressed the knee down towards the ball providing isometric contraction of the hip extensors. It's emphasized that the patient is doing correct contraction of the gluteus maximus and abdominal muscles providing proper stabilization of pelvis during the contraction. Provided 12x2 times on the affected leg.
11. PIR of ADD of hip using red-cord/therapy master based on principles of Lewit. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the medial surface of the patients knee. The other hand fixate the pelvis to avoid tilt during the movement. The leg is moved in full abduction. 3 rounds of inhaling with minor contraction in adduction followed by exhalation and relaxation of the muscle slight pressure in abduction was made as the patient relaxed. The process was repeated 3 times.
12. Glut-bridge with rhytmic stabilization. Provided with the patient the patient in supine position with flexion of hip and knee. The patient raise the hip from the table in an isotonic movement where the patient holds the position in an isometric contraction. Small resistance was provided to the hip in multiple directions for isometric strengthening of gluteal muscles, abdominals and general pelvic stabilizers. The patient held the position for about 10 seconds before relaxing for about 15-20 seconds and repeating the movement 4 times.
13. Mobilization of toes, lisfranc, tallocrural and knee joint, according to Lewit.
14. Mobilization of fingers, wrist and radioulnar joint, according to Lewit.
15. Instruction in proper gait with crutches.

Conclusion: There was improvement both in muscle strength and ROM during today's therapeutic unit. The patient is to a larger degree able to move the hip in ABD through the full ROM on her own. This indicates elongation of ADD as well as increased strength of ABD of hip. The blockage of left fibular head is now looser although it's still somewhat restricted. The pain is also decreased according to the patient and she will try to sleep tonight without painkillers. The patient shows good motivation for further rehabilitation and auto-therapy.

Date: 09.02.12 Time: 09.00-09.30

Status:

Subjective: The patient slept without painkillers for the first time since the surgery and she slept all

night. She feels good to day and has no pain. After yesterdays session she felt energized although she was tired in the muscles.

Objective: The gait is further improved today. There are less signs of compensatory movement of quadratus lumborum and more extension of the hip and proper flexion of the knee in the gait pattern.

Objective of todays therapeutic unit: Further work to improve strength and quality of movement patterns. Increasing ROM and loosen hypertonic muscles.

Therapy proposal: Since the state of the patient is better and she is able to stand in a stabile matter, some of the exercises could be done in a standing position. Continue to work on the ROM and strengthening of hip and pelvis stabilization. STT on lower extremities and back along with trigger point therapy for trigger points. Manual methods of small and major joints of upper and lower extremities are also indicated.

Therapy execution:

1. STT in cranial and transverse direction of lower extremities and lower back. Both skin, fascia and muscles. fascia was treated perpendicular to the underlying muscle fibers. Muscles however was treated in same direction as the fibers of the muscles mostly in cranial direction to increase blood flow and lead to a more rapid healing process along with relaxation of the muscles.
2. Scar therapy around the operation wound without going past the boarder of the plaster. STT of the tissues around the scar in cranial direction focusing on the subcutaneous tissue and fascia.
3. Passive movement in ABD of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the medial surface of the patients calf. The other hand fixate the pelvis to avoid tilt during the movement. The movement was made though the full range of motion about 15-20 times.
4. Passive movement in flexion of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my contralateral hand was placed under the patients knee and the ipsilateral hand on the anterior side of the patients ankle. The movement was made by me in flexion of the knee and the hip in about 70-80°. The movement was repeated about 15-20 times.

5. Active isotonic movement in ABD of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the lateral surface of the patients knee. The other hand fixate the pelvis to avoid tilt during the movement. The movement was made though the full range of motion against slight restriction given in medial direction by my ipsilateral hand. The movement was made 12x2 times.
6. Active isotonic movement in flexion of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my contralateral hand was placed on the anterior surface of the lower thigh and the ipsilateral hand on the anterior side of the patients ankle. The movement was made in flexion of the knee and the hip in about 70-80° with slight resistance against the anterior side of the thigh. The movement was repeated 12x2 times.
7. PIR of ADD of hip using red-cord/therapy master based on principles of Lewit. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the medial surface of the patients knee. The other hand fixate the pelvis to avoid tilt during the movement. The leg is moved in full abduction. 3 rounds of inhaling with minor contraction in adduction followed by exhalation and relaxation of the muscle slight pressure in abduction was made as the patient relaxed. The process was repeated 3 times.
8. Glut-bridge with rhytmic stabilization. Provided with the patient the patient in supine position with flexion of hip and knee. The patient raise the hip from the table in an isotonic movement where the patient holds the position in an isometric contraction. Small resistance was provided to the hip in multiple directions for isometric strengthening of gluteal muscles, abdominals and general pelvic stabilizers. The patient held the position for about 10 seconds before relaxing for about 15-20 seconds and repeating the movement 4 times.
9. Strengthening of hip in ABD in standing position. The patient was standing with both hands on a wall bar. The patient provided isotonic movement of abduction of the hip while I was fixating the hip to avoid tilt of the pelvis. The movement was repeated about 15-20 times in two sets.
10. Strengthening of hip in flexion in standing position. The patient was standing with both hands on a wall bar. The patient provided isotonic movement of flexion of the hip and knee. This movement was done to improve the toe off stage of gait and improve the gait pattern of the patient. Repeated about 15-20 times in two sets.

11. Strengthening of hip in extension in standing position. The patient was standing with both hands on a wall bar. The patient provided isotonic movement of extension of the hip. I corrected the movement for the patient to provide the movement with gluteus maximus and not in extension of the lumbar spine. Repeated about 15-20 times in two sets.
12. Mobilization of toes, lisfranc, tallocrural and knee joint, according to Lewit.
13. Mobilization of fingers, wrist and radioulnar joint, according to Lewit.

Conclusion: There is further improvement in both muscle strength and ROM. The patient is able to move with more ease and less pain. The patient is able to move the hip in ABD close to the range of passive movement actively. There are still restriction in the same joint as earlier, but there is no worsening as a cause of over-load, and there is no pain.

Date: 10.02.12 Time: 09.00-10.00

Status:

Subjective: The patient is rested and motivated for the session. There has not been pain in the joint during the night and she has slept well. She feels that she moves more easily and doesn't get so fatigued after walking for a while.

Objective: The walking is further improved. She has modified the three-point crutch gait to more forward movement of the unaffected leg and more extension in the effected limb. This technique is harder to manage, but more effective for forward motion.

Therapy proposal: To days therapy will be somewhat shortened to make time for the final kinesiological examination. Pain and to hard strain on the muscles should be avoided as that could affect the results of the final kinesiological examination. PIR of short muscles should be emphasized along with manual methods of restricted joints and as a preventive measure. Some strengthening is as usual indicated as there is still weakness of some of the muscles surrounding the hip joint.

Therapy execution:

1. STT in cranial and transverse direction of lower extremities and lower back. Both skin, fascia and muscles. fascia was treated perpendicular to the underlying muscle fibers. Muscles however was treated in same direction as the fibers of the muscles mostly in cranial direction to increase blood flow and lead to a more rapid healing process along with relaxation of the muscles.

2. Scar therapy around the operation wound without going past the boarder of the plaster. STT of the tissues around the scar in cranial direction focusing on the subcutaneous tissue and fascia.
3. Passive movement in ABD of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the medial surface of the patients calf. The other hand fixate the pelvis to avoid tilt during the movement. The movement was made though the full range of motion about 15-20 times.
4. Passive movement in flexion of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my contralateral hand was placed under the patients knee and the ipsilateral hand on the anterior side of the patients ankle. The movement was made by me in flexion of the knee and the hip in about 70-80°. The movement was repeated about 15-20 times.
5. Active isotonic movement in ABD of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the lateral surface of the patients knee. The other hand fixate the pelvis to avoid tilt during the movement. The movement was made though the full range of motion against slight restriction given in medial direction by my ipsilateral hand. The movement was made 12x2 times.
6. Active isotonic movement in flexion of hip using red-cord/therapy master. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my contralateral hand was placed on the anterior surface of the lower thigh and the ipsilateral hand on the anterior side of the patients ankle. The movement was made in flexion of the knee and the hip in about 70-80° with slight resistance against the anterior side of the thigh. The movement was repeated 12x2 times.
7. PIR of ADD of hip using red-cord/therapy master based on principles of Lewit. The sling of the red-cord was wrapped around the patients heel holding the foot just over the surface of the table. The manual contact of my ipsilateral hand was on the medial surface of the patients knee. The other hand fixate the pelvis to avoid tilt during the movement. The leg is moved in full abduction. 3 rounds of inhaling with minor contraction in adduction followed by exhalation and relaxation of the muscle slight pressure in abduction was made as the patient relaxed. The process was repeated 3 times.

8. Glut-bridge with rhytmic stabilization. Provided with the patient the patient in supine position with flexion of hip and knee. The patient raise the hip from the table in an isotonic movement where the patient holds the position in an isometric contraction. Small resistance was provided to the hip in multiple directions for isometric strengthening of gluteal muscles, abdominals and general pelvic stabilizers. The patient held the position for about 10 seconds before relaxing for about 15-20 seconds and repeating the movement 4 times.
9. Strengthening of hip in extension. The patient was in prone position with flexion of the knee in about 80-90°. As the patient provided isometric movement of the hip in extension I provided slight resistance to the posterior side of the distal thigh and fixated the pelvis to avoid extension of the lumbar spine. The movement was repeated 12x2 times.
10. Mobilization of toes, lisfranc, tallocrural and knee joint, according to Lewit.
11. Mobilization of fingers, wrist and radioulnar joint, according to Lewit.

Conclusion: As the patient is now more used to the therapy regime, the result of the therapy are progressing. Especially the PIR are more effective now than it was the first sessions. The patient pushes herself further and gets better results from the strengthening as well as the technique improves and muscles gets stronger.

3.6 Final Kinesiological Examination

Performed 10.02.12

Changes from the initial kinesiological examination are marked with bold letters.

3.6.1 Postural Examination

Posterior:

- Prominence of dexter achilles tendon
- Brachioradial triangle bigger on left side
- Dexter convex in lumbar and lower thoracic spine
- Sinister convex upper thoracic and cervical spine
- Slight winged scapula most on right side
- Elevation of right shoulder

Lateral Dexter:

- Ankle in neutral position
- Knee locked in extension
- Hip in neutral position
- Slight hyperlordosis of lumbar spine
- Slight hyperkyphosis of thoracic spine
- Forward head position
- Counterclockwise rotation of trunk
- Semiflexion of elbow
- Protraction of dexter shoulder

Lateral Sinister: Reduced weight-bearing on sinister leg.

- Ankle in slight plantar flexion
- Semiflexion of knee
- Semiflexion of hip

- Slight hyperlordosis of lumbar spine
- Slight hyperkyphosis of thoracic spine
- Forward head position
- Semiflexion of elbow
- Slight protraction of shoulder

Anterior:

- Curled toes in flexion about 40°
- External rotation of feet.
- Deformation of toes with toe plantar flexion
- External rotation of knees
- Semiflexion of hip
- Abdominal curvature larger on left side
- Higher elevation of right shoulder.

Pelvis examination:

- Crista iliaca: 1,5 cm higher on sinister side
- Anterior superior iliac spine: 1,5 cm higher on sinister side
- Posterior superior iliac spine: 1,5 cm higher on sinister side

3.6.2. Palpation:

Lower extremities:

Muscle:	**Left:**	**Right:**
Plantar aponeurosis	Normal tone	Hypertone
Triceps surae	Hypertone	Hypertone
Dorsal flexors of foot	Normal tone	Hypertone
Adductors of hip	**Hypertone to less extent**	Normal tone
Rectus femoris	**Hypertone to less extent**	Normal tone
Vastus medialis/intermedialis/lateralis	**Hypertone to less extent**	Slight hypertone
Abductors of hip	Hypertone	Normal tone
Hamstrings	Hypertone	Normal tone
Gluteals	**Hypotone to less extent**	**Hypotone to less extent**
Piriformis	**Hypertone without TP**	Hypertone

Fig 3.6.1: Lower extremity palpation

Upper Thorax

Muscle:	**Left:**	**Right:**
Latissimus Dorsi	Normal tone	Normal tone
Lower and Middle Trapezius	Normal tone	Normal tone
Teres major	Normal tone with TP	Normal tone with TP
Infraspinatus	Normal tone with TP	Normal tone
Supraspinatus	Hypertone	Normal tone
Upper trapezius	Hypertone	Hypertone
Deltoid	Hypertone	Hypertone
Pectoralis minor	Hypertone with TP	Hypertone
Subscapularis	Hypertone with TP	Hypertone with TP

Fig. 3.6.2: Upper trunk palpation

3.6.3. Movement patterns according to Janda:

Dexter Hip Extension:

- Contraction of ipsilateral erector spinae before contraction of gluteus maximus.
- **Contraction of gluteus maximus, with strength enough to move the leg into extension with less compensatory movement of pelvis than at initial kinesiological examination.**

Sinister Hip Extension:

- Contraction of ipsilateral erector spinae before contraction of gluteus maximus.
- **Contraction of gluteus maximus with strength to move the leg into extension, even though there was some movement of pelvis at the end of ROM.**

Dexter Hip ABD: performed in prone position as patient cannot lie on operated side.

- Activation of tensor fascia latae before gluteus medius.
- Partially compensation movement with quadratus lumborum **only at the end of the movement.**
- **Moves the leg in slight flexion during initiation of the movement, but is able to move it through the full ROM.**

Sinister Hip ABD: with pillow between the legs to avoid ADD over midline of the body.

- Activation of quadratus lumborum in initiation of the movement, **along with slight flexion of hip.**
- **Activation of gluteus medius is improved since the initial examination. The patient is now able to move the leg in about 30 ABD.**

Neck Flexion:

- Movement mainly into protraction.
- Are able to hold the position with some tremor at the end.
- Not comfortable for the patient.

Trunk Flexion:

- The patient is not able to perform the movement without use of hip flexors.
- Moves in influent movement and not through the full ROM due to contraindication of flexion in the hip.

Dexter Shoulder ABD:

- Initiate movement with elevation of shoulder through activation of upper trapezius muscle.
- Activation of quadratus lumborum, but without lateral flexion.

Sinister Shoulder ABD:

- Initiate movement with elevation of shoulder through activation of upper trapezius muscle.
- Activation of quadratus lumborum, but without lateral flexion.

Push-up: Performed static on knees and elbows.

- Alata scaplua with ADD on both sides due to weakness of serratus anterior. More on sinister side than dexter.

3.6.4 ROM according to Kendall

Direction:	**Left; active**	**Right; active**	**Left; passive**	**Right; passive**
Upper extremity: Shoulder				
Flexion (180°)	160	160	170	170
Extension (50°)	40	40	45	45
Abduction (180°)	170	170	180	180
Adduction (30°)	20	20	30	30
Int. rotation (90°)	90	90	90	90
Ext. rotation (80°)	70	70	75	75

Upper extremity: Elbow				
Flexion (150°)	135	120	140	130
Extension (0°)	- 30	- 30	- 30	- 30
Supination (90°)	50	**60**	50	**60**
Pronation (90°)	60	**80**	60	**80**

Upper extremity: Wrist				
Flexion (80°)	70	70	80	80
Extension (70°)	50	50	60	60
Ulnar duction (30°)	20	20	25	25
Radial duction (20°)	10	**15**	10	**15**

Lower extremity: Hip				
Flexion (120°) **flexed knee**	**90 stopped because of contraindication.**	100	**90 stopped because of contraindication.**	110
Flexion (90°) **extended knee**	**55**	70	**60**	80
Extension (30°)	**20**	**20**	**25**	**25**
Abduction (50°)	**30**	35	**40**	40
Adduction (30°)	N/A	10	N/A	20
Int. rotation (40°)	N/A	20	N/A	30
Ext. rotation (50°)	N/A	30	N/A	40

Lower extremity: Knee				
Flexion (150°)	**120**	130	**130**	130
Extension (0°)	0	0	0	0

Lower extremity: Ankle				
Plantarflexion (40°)	30	40	30	40
Dorsiflexion (20°)	**10**	10	10	**15**
Inversion (20°)	0	0	0	0
Eversion (10°)	0	0	0	0

Fig. 3.6.3: ROM according to Kendall

3.6.5. Neurological Examination

Superficial sensation:Superficial sensation:

Sensory dermatome and associated nerves:	**Left:**	**Right:**
L1 – Iliohypogastric, Ilioinguinal, Genitofemoral, Dorsal rami of L1-3	Physiological to light touch throughout the dermatome	Physiological to light touch throughout the dermatome
L2 – Obturator, Anterior femoral cutaneous, Genitofemoral, Lateral femoral cutaneous, Dorsal rami of L1-3	Physiological to light touch throughout the dermatome	Physiological to light touch throughout the dermatome

L3 – Obturator, Anterior femoral cutaneous, Saphenous.	Dysesthesia anteromedial below knee joint.	Physiological to light touch throughout the dermatome
L4 – Saphenous, Lateral cutaneous of calf, Superficial peronea.	Dysesthesia anteromedial below knee joint.	Physiological to light touch throughout the dermatome
L5 – Superficial peroneal, Lateral cutaneous of calf, Deep peroneal.	Physiological to light touch throughout the dermatome	Physiological to light touch throughout the dermatome
S1 – Dorsal rami of S1-3, Posterior femoral cutaneous, Superficial peroneal, Lateral cutaneous of calf, Sural, Calcaneal, Medial plantar, Lateral plantar	Physiological to light touch throughout the dermatome	Physiological to light touch throughout the dermatome

Fig. 3.6.4: Superficial sensation.

Proprioception:

- Heel from knee to first toe: Normal, only performed with right leg as to avoid rotation in the hip
- Position test: The patient was able to copy the position of both legs and distinguish movement of the limb.

Tendon Reflexes:

Tendon relex (innervation):	**Left:**	**Right:**
Patellar reflex (L4):	2+ (slight hyporeflex)	3 (physiological)
Hamsting reflex (L5):	2 (hyporeflex)	2+ (slight hyporeflex)
Achilles reflex (S1):	2 (hyporeflex)	3 (physiological)
Plantar reflex (S1):	3 (physiological)	3 (physiological)

Fig. 3.6.5: Tendon reflexes

- The decrease in tendon reflex response might be caused by the patients inability to relax. After several attempts there was improvement of the response.

Pathological signs:

- Babinski: Negative on both sides.

Motor function:

Muscle and associated nerve:	**Left:**	**Right:**
Tibialis anterior (L4, L5) – deep peroneal.	Physiological	Physiological
Extensor hallucis longus (L4, L5, S1) – deep peroneal.	Physiological	Physiological
Peroneus longus (L5, S1) – superficial peroneal	Physiological	Physiological

Fig. 3.6.6: Neurological motor function

3.6.6. Joint Play according to Lewit

Joint/Exam.	**1st Digit**	**2nd Digit**	**3rd Digit**	**4th Digit**	**5th Digit**
Dex. Dist. IP: Dorsal	Restricted	Restricted	Restricted	Restricted	Restricted
Sin. Dist. IP: Dorsal	Restricted	Restricted	Restricted	Restricted	Restricted
Dex. Dist. IP: Plantar	Restricted	Restricted	Restricted	Restricted	Restricted
Sin. Dist. IP: Plantar	Restricted	Restricted	Restricted	Restricted	Restricted
Dex. Dist. IP: Lateral	Restricted	Restricted	Restricted	Restricted	Restricted
Sin. Dist. IP: Lateral	Restricted	Restricted	Restricted	Restricted	Restricted
Dex. Prox. IP: Dorsal	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Dorsal	Restricted	No restriction	No restriction	No restriction	No restriction
Dex. Prox. IP:	Restricted	No restriction	No restriction	No restriction	No restriction

Plantar					
Sin. Prox. IP: Plantar	Restricted	No restriction	No restriction	No restriction	No restriction
Dex. Prox. IP: Lateral	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Lateral	Restricted	No restriction	No restriction	No restriction	No restriction
Dex. MTP: Dorsal	Restricted	Restricted	Restricted	Restricted	Restricted
Sin. MTP: Dorsal	Restricted	Restricted	Restricted	Restricted	Restricted
Dex. MTP: Plantar	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. MTP: Plantar	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. MTP: Lateral	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. MTP: Lateral	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. MTP: Rotation	No restriction				
Sin. MTP: Rotation	No restriction				
Dex. MT heads: Dorsal	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. MT heads: Dorsal	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. MT heads: Plantar	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. MT heads: Plantar	No restriction	No restriction	No restriction	No restriction	No restriction

Joint:	**Dorsal:**	**Plantar/Ventral:**	**Rotation: (int./ext.)**	**Lateral:**
Dex. Lisfranc	No restriction	No restriction	No restriction	
Sin. Lisfranc	No restriction	No restriction	No restriction	

Dex. Cuboid	No restriction	No restriction		
Sin. Cuboid	No restriction	No restriction		
Dex. Naviculare	No restriction	No restriction		
Sin. Naviculare	No restriction	No restriction		
Dex. Calcaneus				No restriction
Sin. Calcaneus				No restriction
Dex. Tallocrural	No restriction			
Sin. Tallocrural	No restriction			
Dex. Knee	No restriction	No restriction		No restriction
Sin. Knee	No restriction	No restriction		No restriction
Dex. Tibiofibular			No rest./No rest.	
Sin. Tibiofibular			No rest./No rest.	
Dex. Head of fibula	No restriction	No restriction		
Sin. Head of fibula	**Restricted**	**Restricted**		

Joint:	**Cranial:**	**Caudal:**	**Rotation:**	**Lateral:**
Dex. Patella	No restriction	No restriction		No restriction
Sin. Patella	**No restriction**	**No restriction**		**No restriction**

Joint:	**Ventral:**	**Dorsal:**	**Rotation:**	**Lateral:**
Dex. Lower SI	Restricted	Restricted		
Sin. Lower SI	Restricted	Restricted		
Dex. Upper SI	Restricted	Restricted		
Sin. Upper SI	Restricted	Restricted		
Lumbar spine	No restriction		No restriction	
Thoracic spine	No restriction		No restriction	
Cervico-thoracic	No restriction		No restriction	
C2-C3	No restriction	No restriction	Restricted	
Dex. SC	No restriction	No restriction		
Sin. SC	No restriction	No restriction		
Dex. AC	No restriction	No restriction		
Sin. AC	No restriction	No restriction		

Joint:	**Ventral**	**Dorsal:**	**Caudal:**	**Lateral:**
Dex. Shoulder	No restriction	No restriction	No restriction	No restriction
Sin. Shoulder	No restriction	No restriction	No restriction	No restriction

Joint:	Ventral	Dorsal:	Caudal:	Lateral:
Dex. Elbow				No restriction
Sin. Elbow				No restriction
Dex. Head of radius	**Less Restricted**	**Less Restricted**		
Sin. Head of radius	No restriction	No restriction		
Dex. Radioulnar	No restriction	No restriction		
Sin. Radioulnar	No restriction	No restriction		
Dex. Radiocarpal	No restriction			No restriction
Sin. Radiocarpal	No restriction			No restriction
Dex. Prox. Carpal	No restriction	No restriction		
Sin. Prox. Carpal	No restriction	No restriction		
Dex. Dist. Carpal	No restriction	No restriction		
Sin. Dist. Carpal	No restriction	No restriction		
Dex. Pisiform			No restriction	No restriction
Sin. Pisiform			No restriction	No restriction
Dex. Schapoid	No restriction	No restriction		
Sin. Schapoid	No restriction	No restriction		
Dex. Capitate	No restriction	No restriction		
Sin. Capitate	No restriction	No restriction		

Joint/exam:	**1st Digit**	**2nd Digit**	**3rd Digit**	**4th Digit**	**5th Digit**
Dex. Dist. IP: Dorsal	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. Dist. IP: Dorsal	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. Dist. IP: Palmar	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. Dist. IP: Palamar	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. Dist. IP: Lateral	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. Dist. IP: Lateral	No restriction	No restriction	No restriction	No restriction	No restriction
Dex. Prox. IP: Dorsal		No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Dorsal		No restriction	No restriction	Restricted	No restriction
Dex. Prox. IP: Palmar		No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Palmar		No restriction	No restriction	Restricted	No restriction
Dex. Prox. IP: Lateral		No restriction	No restriction	No restriction	No restriction
Sin. Prox. IP: Lateral		No restriction	No restriction	Restricted	No restriction
Dex. MCP: Dorsal	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. MCP: Dorsal	No restriction	No restriction	No restriction	Restricted	No restriction
Dex. MCP: Palmar	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. MCP: Palmar	No restriction	No restriction	No restriction	Restricted	No restriction
Dex. MCP: Lateral	Restricted	No restriction	No restriction	No restriction	No restriction

Sin. MCP: Lateral	No restriction	No restriction	No restriction	Restricted	No restriction
Dex. MCP: Rotation	Restricted	No restriction	No restriction	No restriction	No restriction
Sin. MCP: Rotation	No restriction	No restriction	No restriction	Restricted	No restriction
Dex. MC heads: Dorsal	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. MC heads: Dorsal	No restriction	No restriction	Restricted	Restricted	Restricted
Dex. MC heads: Palmar	No restriction	No restriction	No restriction	No restriction	No restriction
Sin. MC heads: Palmar	No restriction	No restriction	Restricted	Restricted	Restricted

Fig. 3.6.7: Joint play according to Lewit

3.6.7. Anthropometric measurements:

Lower extremities:	**Sinister:**	**Dexter:**
Anatomical Length	86 cm	84 cm
Functional Length	93,5 cm	91,5 cm
Thigh	41 cm	39 cm
Circumference thigh	**49 cm**	48 cm
Circumference knee	35 cm	35 cm
Circumference calf	31 cm	32 cm
Circumference ankle	21 cm	20 cm

Fig. 3.6.8: Anthropometric measurements

3.7 Evaluation of the Effect of the Therapy

The examinations and therapeutic methods I used during the rehabilitation of the V. B. Where mostly based on the principles of Janda et al.(2007), Kendall et al. (2005) and Lewit (2010).

The postural examination according to Kendall: A plumb line is place vertically as a point of reference of the alignment for the different body segments. The plumb is placed through the calcaneocuboid joint and the posture of the patient is evaluated in relation to the line.

The palpation of the muscles are done according to the principles of Lewit: It is performed with increasing pressure in direction perpendicular to the muscle fibers. Comparison of the contralateral and ipsilateral muscles is essential as there may be individual differences according to somatotype and fitness level. Hyperalgesic zones are found by very slight pressure along the surface of the skin. Heightened friction or sweat is indication of a hyperalgesic zone.

Movement patterns are based on the principles of Janda: It is based on dynamic kinesiology under the philosophy that the brain does not know muscles, the brain knows movement and the movement is controlled by a reflex process. According to Janda muscular imbalance can be reviled by the movement patterns in certain movements.

Range of motion according to Kendall: The measurements are taken with a goniometer and the endpoints of the joints ROM. The parameters in which the ROM is compared to is based on the findings of Kendall.

Joint play examination according to Lewit: The assessment of the mobility of the joint is done in multiple directions according to the joint being examined. The manual contact is provided close to the center of the joint and the two bones are pulled to the end of the barrier. The assessment is subjective from the therapist point of view a can therefor differ somewhat. It's essential to compare the contralateral joints due to individual differences according to body type, age and muscle composure.

Neurological tests are done to check for any signs of neurological damage. During any invasive action there is a slight chance for damaging nerves which can lead to dysesthesia, paresis or dis coordination and weakness (Siopack et al 1995). The test consists of stimulation of different nerve endings associated with different dermatomes and nerves to distinguish where the fault might be if any pathological signs are discovered. The first test is a test of superficial sensation along dermatomes divided into spinal segment in which they originate. The second is a proprioceptive test where the patient leads the heel of one foot down from the knee to the toe of the contralateral leg. The test is done with eyes closed so the patient have to rely on proprioceptive information to

coordinate the movement. Further the therapist places the limb passively in a certain position and ask the patient to copy the position with the contralateral limb. The last proprioceptive test I performed consisted of moving a joint segment slowly in different directions while the patient notified me when she felt the initiation and stoping of the movement. All the proprioceptive testes are done with eyes closed to eliminate visual control of the limbs position. The last neurological examination I performed was a functional test of muscles associated with nerves of the lower limb (Ward 2002). It was not a test of strength but a test of physiological function as nerve damage to the nerves of the muscles would affect the muscles function. The test was performed by the principles of manual muscle testing by Kendall, but not aimed at muscle strength, at function.

Anthropometric measurements are made for comparison of the limbs. Any asymmetrical findings are non-physiological. After a total hip arthroplasty there might be swelling, differences in muscular trophy or differences in the length of the lower extremities.

Soft-tissue techniques is a treatment of soft tissues aimed to loosen hypertonic soft tissue like skin, subskin, fascia and muscles. It also aims to increase blood flow and assist in the regeneration of damaged tissue. The procedure starts superficially on the skin and gradually goes deeper to the subskin and muscles. The patient often finds this technique pleasant and relaxing so it has a beneficial psychological effect as well.

PIR according to Lewit it a technique aimed to stretch shortened muscles or relax hypertonic muscles. It can also be applied in the treatment of trigger points. It consists of a slight isometric contraction followed by relaxation. The technique is applied with the muscle in its maximum length. The patient takes a deep breath while making a slight isometric contraction against resistance made by the therapist. The patient holds the position for a few seconds before relaxing while exhaling. The muscle is then stretched by the force of gravity or by slight pressure from the therapist. The range of motion should gradually increase and the process is repeated after about 20 seconds of relaxing in the stretching position.

The therapeutic procedures are based on the same principles and are explained in the day to day therapy.

The therapy master also known as red-cord is a device developed in Norway and aims to assist is strengthening and rehabilitation in physiotherapy. It is mounted in the sealing above the therapy bench. The cords are easily adjustable and helps the patient to keep the limb in a certain position. There are several other applications for the

Fig. 3.7.1: Red-cord/Therapy master. (wikipedia.org, 2012)

device like elastic bands that either provide resistance or assistance in active movements. The device is commonly used in rehabilitation facilities in Norway, but not as common in the Czech Republic. Al though they are often found in the facilities, they are seldom used.

As the patient was diagnosed with Psoriatic Arthritis as well as total hip arthroplasty, she had a number of secondary issues detected in the initial examination. Eg. The deformities of the metacarpophalangeal joints the elbow and toes. I chose to do some treatment also in joints of the upper extremities as well as the lower. This was a more general preventive treatment in which I did not expect to see improvement or worsening. But the treatment of psoriatic arthritis was not the main aim of the therapy.

Comparison of initial and final passive ROM				
Joint	**Sinister (initial)**	**Dexter (initial)**	**Sinister (final)**	**Dexter (final)**
Hip Flexion (120°) flexed knee	N/A	100	90 stopped because of contraindication.	110
Flexion (90°) **extended knee**	50	80	60	80
Extension (30°)	15	20	25	25
Abduction (50°)	20	40	40	40
Knee flexion (150°)	100	130	130	130
Ankle Dorsiflexion (20°)	0	10	10	15

Fig. 3.7.1: Comparison of initial and final passive ROM

I comparison of initial examination and final examination, there is a profound improvement of both ROM and muscle strength, taken in consideration that it had only gone one week. Although there was still some restriction of movement in the hip, there is improvement that to a large degree positively impacts the locomotion of the patient. As the function of the limb is the most important parameter as opposed to exact degrees of ROM and isolated muscle strength, I would say that the goal of making the patient independent is on it's way to completion.

As a slightly contrivers kind of treatment I chose to actively use red-cord as a part of the therapeutic regime. This is because I have good experience with this from former practices in Norway. It's not commonly used in the Czech Republic, but I chose to use it as it places the limb in firm fixation in an anti gravitational position with both of my hands free to assist the movement and provide fixation proximal to the origin of movement. I find this useful especially in PIR of the adductors. I

fixate the red-cord at the distal part of the leg. This freed my ipsilateral hand to provide slight pressure on the medial side of the leg and pull it in abduction while fixating the pelvis with my contralateral hand. In strengthening I provided the resistance at the lateral side of the leg and provided resistance in abduction. The patient found this to be an effective and comfortable way of exercise and PIR. The principles of the method are based on the methodology of Lewit, but it's slightly modified for the use of red-cord. I used the same method on several patients and they were all pleased with the comfort in which they were able to perform the exercise and the effects of the PIR and strengthening. The downside with using red-cord is that the therapist done get the same subjective information as the physical contact with the patient is reduced. Therefor I would not use the red-cord at the first therapy session. I would use that session to gather information about the patient's condition and for that to be possible its crucial with sensory input concerning the patients strength and quality of movement.

With exception of the usage of red-cord in my therapy I mostly used conservative methods which has proven effective before. From earlier experience I have spent some time treating patients with total hip replacement and find strengthening and stretching PIR to be the most effective means of rehabilitation. Due to my limited experience of longer periods with one patient, I was to a large degree depending on the experience of my supervisor and other coworkers. I followed their guidance on which therapy to emphasize, but was mostly working independently with my supervisor available for questions when I was uncertain about something. However, the experience from the practice with this patent confirmed my past experiences. Strengthening according to the principles of muscular function according to Kendall and PIR with the combined knowledge of Lewit and Kendalls methods made me able to provide both strengthening and stretching to the muscle group I wanted to emphasize. In addition to strengthening and stretching, STT was a part of every days therapeutic unit. It's hard to assess the effectiveness of STT, as there is no way of knowing what the situation would be like if non was provided. But there is scientific evidence suggesting it aids in the healing process of the injury and removes local metabolites and waste products(Ward et al., 2002). This also help aids in thromboembolic prevention and is therefor an important part of the post-operative treatment even though the result of the therapy is not as apparent.

For future therapy when the hip is recovered, exercise focusing on the deep stabilization of the pelvis and core of the trunk are advised. This could be done by sensomotoric training on posturomed, gymball or postural positioning. It's however important to restore the function of the hip joint before focusing on secondary issues. The patient should be encouraged to do self therapy and to keep active as long as it doesn't induce pain (Ritchlin et al., 2009).

Considering the week I worked with the patient, the therapy that was applied was a success. The patient was grateful and satisfied whit the therapy and the progress. It's however important for proper rehabilitation that the patient continues with self therapy at home. Taken in consideration the age of the patient at the psoriatic arthritis it's not likely that the patient will restore full function of the leg nor the other affected limbs. However the patient can achieve full independency and functional movement for ADL. For patients prone for osteoarthritis it's important to keep the joint in motion without to much loading, so for this patient it would be good to continue swimming when the hip is healed (Ritchlin et al., 2009).

The time I spent at Revmatologicky Ustav was both challenging and educational. During each day I had several patients with several different diagnoses. I had about 8 patient each day and about 30 minutes with each of them. All of the patients at this hospital is in-patients so I had the pleasure of working with the same patients every day for about a week at the time. During this period I saw great improvement in several of them. Especially those with an orthopedic diagnosis as well as an rheumacological one. I had a few patients with server degrees of rheumacological disease and it was very interesting and challenging working with patients with long progression of the disease. Especially those with scleroderma made an impression as I had no prior experience with that diagnosis. All in all I acquired a greater knowledge and experience during my practice that will become useful in my further carrier in clinical practice.

4. Conclusion

I chose my patient partially because she was not so long after surgery so it was a good opportunity for me to see the progress of the therapy in an early stage of the rehabilitation. When I first meet the patient she was not in a good state. This was partially caused by general fatigue due to lack of sleep but also due to pain and discomfort in the area of the operation. Her ROM was very restricted, especially into extension and abduction. As the patient had gone through this kind of surgery before she knew approximately what she had in store. This might had contributed to frustration as she knew she had a long way to go before she would be fully recovered. The therapy plan was therefor mainly concerned with increasing the range of motion and restore functionality as soon as possible.

At Revmatologicky Ustav where I had my practice, there is several patients with the same diagnosis at any time. There is a certain manual in which they work with this kind of diagnosis. STT is a fundamental part of the therapy and almost all therapy sessions are initiated with STT as long as it's not contraindicated. Manual methods are also a central part of the rehabilitation at this facility. There are mostly patients diagnosed with some kind of rheumatological disease in which keeping the joint play in order is an important part of the preventive measures as long as there is no pain or signs of osteoporosis or other contraindications. I choose to make both this techniques a central part of my therapy as there was no contraindications against it. The reason for this was that I believe that the experience of my coworkers at Revmatologicky Ustav has proven good results from this kind of therapy regime and I didn't want my patient to undergo a total different regime if she was treated by one of the other therapists there. In a long time perspective I considered that as the best option for treatment of this patient.

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6. Annexes

6.1 Informed consent form

INFORMOVANÝ SOUHLAS

V souladu se Zákonem o péči o zdraví 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 s uveřejněním výsledků terapie v rámci bakalářské práce na FTVS UK. Osobní data v této studii nebudou uvedena.

Dnešního dne jsem byla odborným pracovníkem poučena o plánovaném vyšetření a následné terapii. Prohlašuji a svým dále uvedeným vlastnoručním podpisem potvrzuji, že odborný pracovník, který mi poskytl poučení, mi osobně vysvětlil vše, co je obsahem tohoto písemného informovaného souhlasu, a měla jsem možnost klást mu otázky, na které mi řádně odpověděl.
Prohlašuji, že jsem shora uvedenému poučení plně porozuměla a výslovně souhlasím s provedením vyšetření a následnou terapií.
Souhlasím s nahlížením níže jmenované osoby do mé dokumentace a s uveřejněním výsledků terapie v rámci studie.

Datum:……

Osoba, která provedla poučení:……

Podpis osoby, která provedla poučení:……

Vlastnoruční podpis pacienta /tky:…….

6.2 Ethics Board Review

CHARLES UNIVERSITY IN PRAGUE
FACULTY OF PHYSICAL EDUCATION AND SPORT
José Martího 31, 162 52 Praha 6-Veleslavín
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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: Total hip replacement in patient with Psoriatic Arthritis

Nature of the research project: Bachelor's thesis

Author: Christian Enstad

Supervisor: Mgr. Kateřina Maršáková

Research project description: Case Study of physiotherapy treatment of a patient with the diagnosis of total hip athroplasty will be conducted under the expert supervision of an experienced physiotherapist at Revmatologicky Ustav.
Guaranteed safety to be judged by experts:
No invasive methods will be used.
Ethical aspects of the research:
Personal data obtained during the investigation will not be published.
Draft Informed Consent (enclosed)

Date: 05.04.12 Author's signature:

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

Ethics Board members: Doc. MUDr. Staša Bartůňková, CSc.
Prof. Ing. Václav Bunc, CSc.
Prof. PhDr. Pavel Slepička, 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: 098/2012
Date: 6.4.2012

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.

Official school stamp

Signature, REB Chairman

UNIVERZITA KARLOVA v Praze
Fakulta tělesné výchovy a sportu
José Martího 31, 162 52, Praha 6
2

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6.4 List Abbreviations

ABD	Abduction
AC-joint	Acromioclavicular joint
ADD	Adduction
ADL	Activities of Daily Living
AM	Ante Meridiem = before noon
BMI	Body Mass Index
Cm	Centimeter
Dex.	Dexter = Right
Dist.	Distal
E.g.	Exempli Gratia = for example
ER	External rotation
FTVS	Fakulta Telesne Vychovy a Sportu
i.e.	Id Est = Which means
IP	Interphalangeal
IR	Internal Rotation
Kg	Kilogram
Min	Minutes
MTP	Metatarsophalangeal
N/A	Not Applicable/Not Available
PIR	Post Isometric Relaxation
PNF	Proprioceptive Neuromuscular Facilitation
P.M.	Post Meridiem = after noon
Prox.	Proximal
ROM	Range Of Motion
SC-joint	Sternoclavicular joint
Sin.	Sinister = Left
STT	Soft Tissue Techniques
TMT	Tarsometatarsal
TP	Trigger Point