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Sports.

Department of Physiotherapy.

Physiotherapy Case Study of

Rheumatoid Arthritis.

Bachelor Thesis.

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Abstract

“Physiotherapy Case Study of Rheumatoid Arthritis.”

The following Bachelor thesis case study was taken place at the Institute of Rheumatology, Prague, Czechia, for 2 weeks of period. The practice was carried under the supervision and guidance of Markéta Mikulášová.

The main objective of this case study is to analyse the diagnosis of the patient with rheumatoid arthritis. Physiotherapeutic planned methods were executed on the rheumatoid arthritis patient to reach an optimal healthy state of the patient and to prevent any further complications.

The thesis is divided into two main parts. Firstly, the Theoretical part which includes basic general outlook of the disease rheumatoid arthritis. Secondly, the main Practical part of the thesis, which includes the overall analyse of the patient with rheumatoid arthritis. Containing all the physiotherapy examinations required regarding the disease, followed by the therapy sessions done to achieve all the goals that were deducted from the examination, final physiotherapy examination in order to compare the changes or goals achieved from the initial examinations and lastly the results conclusion.

The main goal of the therapy was to reduce the pain of the patient, improve the ROM especial of the hands for the ADL and delay the progressions of the deformity. The methods used mainly for the case therapy were manual techniques and exercises to improve the ROM, along with sensorimotor stimulation and myofascial release to ease the tension on the extremities. No invasive methods were used.

On the bright side, due to patients dedication and will to participate anxiously in the therapy program helped in resulting improved ROM especially of the hands and fingers, along with the activation felt in the lower limb, which was not felt in last 3 years. The hypothesis concludes that due to continue therapy and pharmacology patient has chances of positive recovery from the disease prognosis.

Abstract in Czech

"Fyzioterapeutická případová studie Revmatoidní Artritidy."

Kazuistika revmatoidní artritidy

Následující kazuistika v rámci bakalářské práce se po dobu dvou týdnů uskutečňovala v Revmatologickém ústavu v Praze. Praxe probíhala pod dohledem a vedením paní Markéty Mikulášové.

Hlavním cílem této studie bylo analyzovat diagnózu pacienta s revmatoidní artritidou. Byly u něj prováděny plánované fyzioterapeutické metody kvůli optimalizaci jeho zdravotního stavu a k prevenci případných dalších komplikací.

Práce je rozdělena do dvou hlavních částí. Za prvé, část teoretická, která obsahuje základní obecný pohled na revmatoidní artritidu; za druhé, hlavní praktická část, která zahrnuje celkovou analýzu pacienta s revmatoidní artritidou. Tato obsahuje veškerá fyzioterapeutická vyšetření požadovaná v souvislosti s onemocněním a následná terapie, která z vyšetření vyplynula. Dále pak fyzioterapeutická vyšetření s cílem porovnat změny a výsledky z počátečních vyšetření a na konec závěrečné výsledky.

Hlavním cílem terapie bylo snížit bolesti pacienta, zlepšit zvláště ROM pro ADL a zpomalit progresi deformity. Metody používané hlavně pro případovou terapii byly manuální techniky a cvičení ke zlepšení ROM spolu se sensorimotorickou stimulací a myofasciálním uvolněním pro zmírnění napětí v končetinách. Nebyly použity žádné invazivní metody.

Vzhledem k tomu, že pacient má optimistický přístup k životu a je pevně odhodlán spolupracovat s terapeutem, zlepšilo se jeho ROM zejména rukou a prstů a po třech letech opět mohl pohybovat dolní končetinou, což při pokračující terapii a medikaci dává pacientovi dobré vyhlídky na zotavení.

Declaration

The aim of this bachelor thesis case study is to apply physiotherapy procedures and to observe and evaluate the results of the rehabilitation therapy used. All methods applied on the patient with one diagnose are based on the knowledge acquired during the three year Bachelor degree Physiotherapy program at UK-FTVS.

The clinical practice for the bachelor thesis was done under the supervision and guidance of Mgr. Markéta Mikulášová at Revmatologický ústav, Prague, Czechia.

Declaration for the assurance that no invasive methods were used during the practical approach and patient was made aware of the therapy that was given.

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1. Introduction

Rheumatoid Arthritis is one of the most common disabling type of chronic inflammatory autoimmune arthritis. The course of rheumatoid arthritis is unpredictable, in the later stages, interpersonal differences develop at a much higher pace.

In addition, this chronic diseases causes joint pain, stiffness, swelling and decreased movement of the joints. Most commonly affected are the wrist and small joints of the hands and feet. It also causes an impact on other tissues and organs, such affect are the skin, eyes or lungs (28). Therefore, over time it can cause significant functional impairment and reduces the life living period of its wearers.

On the bright side, pharmacotherapy along with rheumatology comprehensive therapy can significantly influence functional fitness, subjective difficulties along with self-sufficiency and social inclusion of the patient. The goal of rehabilitation therapy treatment is to improve the joint mobility, reduce the pain and swelling, as well as to improve the potential of performing the ADL activities.

The main objective of the following case study thesis is to focus on the rehabilitation / physiotherapy approach that has been applied on the patient with diagnose of Rheumatoid arthritis, along with brief look in to the etiologic, evaluation and the effect of the diagnose on the patient.

The practice for the thesis took place at the REV Revmatologický ústav (Institute of rheumatology), Prague, Czech Republic for two weeks from 15th of January till 26th of January 2018.

2. General Information

2.1. Basic Characteristics of Rheumatoid Arthritis

Rheumatoid Arthritis (RA) is a chronic systemic inflammatory disease that primarily affects the joints. It has been determined as symmetric polyarthritis that mostly affects the synovial line of joints of hand and feet; regardless any synovial membrane joint can be affected too. Such related changes to the synovial lining of the joints, tendons, articular capsules and the weight capsules lead to consequent progressive destructions, deformities and decline functions of the joints. Significantly involvement of extra articular organs for instance skin, heart, lungs and eyes is also present (20).

In addition to that, RA is a systemic disease with the presence of variable number of extra-articular symptoms such as sororities, vasculitis, nodule formation, total decalcification, significant protein production and autoantibody production (3, 2).

Often confusion is developed between osteoarthritis and rheumatoid arthritis as being the same; but the main differences is due to the causes of the joint symptoms. Osteoarthritis

is caused by mechanical wear or tear on joints.

Whereas, rheumatoid arthritis is an autoimmune disease in which the blood's own immune system attacks the joints of

the body (4) (Figure 1).

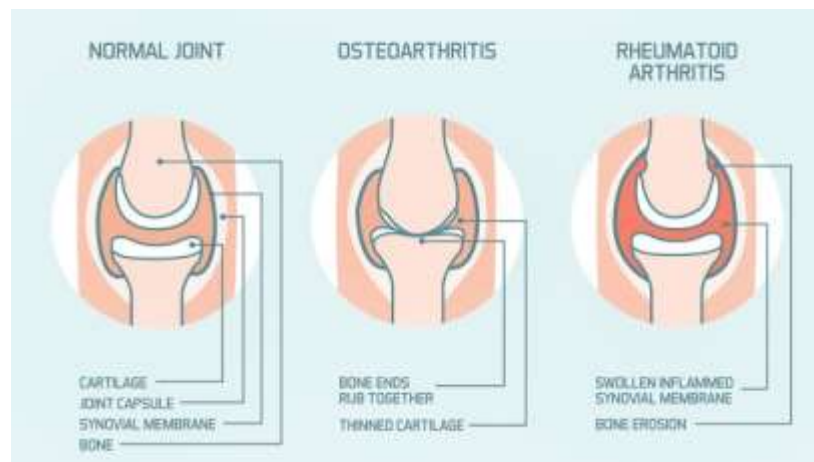


Figure 1 Difference between Osteoarthritis and Rheumatoid arthritis (1)

2.2. Etiology and Pathogenesis

Rheumatoid arthritis is a disease where the body's own immune system attacks its healthy tissue linings of the joint. Therefore, it is known as autoimmune chronic inflammatory disease leading to joint damage. But the exact etiology of the disease is still unknown. According to scientific evidence hereditary factors such as genes, hormones and external environmental factors play a role in developing of RA.

According to researchers, people with specific genetic markers called HLA-DR1 or HLA-DR4 antigen. This HLA genetic site controls immune responses which are recognized by T-lymphocytes and is derived from protein genes of endogenous or exogenous origin.

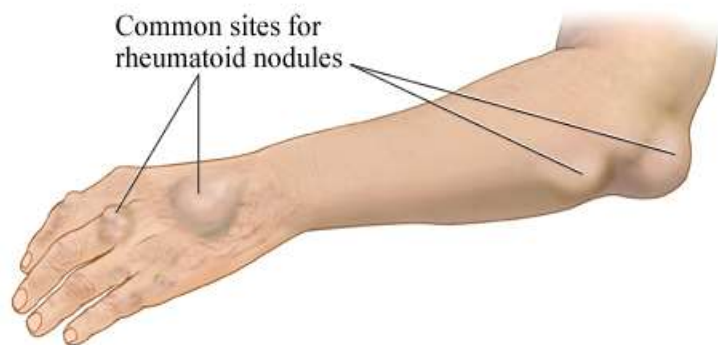
Other gene that helps in regulation and activation of the immune system is STAT4; genes that are relevant to chronic inflammation are TRAF1 and C5; and for the development and progression of RA is PTPN22 gene. However, not all people diagnosed with RA have these genes.

On the other hand, non-genetic host factors or external environmental factors play a role in developing RA. For instance, exposure to cigarette smoke, air pollution, insecticides and occupational exposures to mineral oil and silica. Infectious agents that may trigger development of RA are Epstein-Barr virus, the parvovirus and proteus bacterium and mycoplasma. Females are mostly effected due to female sex hormones and pregnancy hormones. In addition, studies show positive effect of oral hormonal contraceptives in women and risk for women who are pregnant or breastfeeding after the first pregnancy, where the effect of the hormone prolactin triggers it. Whereas, in men it is generally inferred that male sex hormones, especially testosterone are in lower in men diagnosed with RA (1, 12, 22).

Rheumatoid arthritis is an inflammatory process in the synovial membrane. This synovial membrane contributes to the nutritional lining of joints hyaline cartilage. Also affected by the inflammation are the synovia tendon sheaths and bursae. Damaging gradually the joint cartilage as its nutrition and drainage of the articular cavity is affected.

Synoviochondral junction forms pannus tissues in its area. Replacing cartilage affects tendon sheaths, ligaments and disc (27).

The inflammatory consequences of RA disease results in events that the synovial lining of joints and other cells produce cytokines, other chemical mediators and proteolytic enzymes, all together destructs the components of the joints. The smooth normal synovium forms a rough, grainy tissue that grows in the proliferating synovial tissues of the joint cavities and erodes the cartilage. Bone fusion and loss of mobility could be due to the tendons being inflamed, which when shortens reduces the mobility of the joints. Loose and floppy joints arise from ruptured tendons. Moreover, connective tissues are affected too due to RA. Inflammatory nodules at pressure points such as at the elbow, back of hands or heel (Figure 2) can appear gradually or suddenly and may be tender and inflamed. Occasionally, the may disappear spontaneously but if infected or becomes bothersome during activity surgery is needed.



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Figure 2 Inflammatory nodules at pressure points (2)

Four stages are broken down in RA which are (13, 25):

Stage 1	<ul style="list-style-type: none"> • Synovitis is represented, the synovial membrane becomes hyperaemic and oedematous with foci of infiltrating small lymphocytes. • Joint effusions with high cell count (5,000 to 60,000 per mm³) • X-rays will show no destructive changes yet, but soft tissues swelling or osteoporosis maybe seen.
Stage 2	<ul style="list-style-type: none"> • Proliferation of inflamed synovial tissues and grows into the joint cavities across the articulating cartilage, eventually destroying it. • Due to loss of articulating cartilage the joints are narrowed.
Stage 3	<ul style="list-style-type: none"> • Pannus of synovium. • Eroded articular cartilage and exposed sub-chondral bone. • X-rays show extensive cartilage loss, erosions around the margins of the joint and deformities apparent.
Stage 4	<ul style="list-style-type: none"> • Disease end stage. • End inflammatory process is subsiding. • Fibrous or bony ankylosing of joints will end its functional life. • Subcutaneous nodules associated with severe disease.

Table 1 Stages of RA (13, 25)

2.3. Types of Rheumatoid Arthritis

As mentioned above, the direct causes of rheumatoid arthritis is still unclear. But according to the researches it is known to be depended on the genetics.

Further subtypes of rheumatoid arthritis have been defined according to the symptoms and progressions. The treatment of the disease depends on the determination of the doctor whether which kind of RA the patient has from the following.

Firstly, the seropositive rheumatoid arthritis are patients with the presence of anti-cyclic citrullinated peptides (anti-CCPs) in their blood test results. Also known as anti-citrullinated protein antibodies (ACPAs), these antibodies attack the body and produce RA symptoms. The presence of these antibodies appear 5 to 10 years earlier in 60 to 80 % of patients before the RA clinically appear.

Secondly, seronegative rheumatoid arthritis are patients without the presence of ACPAs antibodies in their blood. However, the disease can be diagnosed by many ways such as X-ray results indicating patterns of cartilage and bone deterioration.

Thirdly, the Juvenile rheumatoid arthritis is common arthritis for the age group under the age of 17 years. The children and youth experiences growth issues with symptoms such as swelling, stiffness and joint pains lasting for months. Some may suffer for the rest of the life. Concerns of eye and lymph node inflammations is also present (5).

2.4. Epidemiology and Classification

Rheumatoid arthritis is a common autoimmune inflammatory disease it affects approximately 1% of world population depending on gender, race, ethics and calendar year. It is more common in women to develop at younger age than in men. It affects people between the ages of 30 and 60 years old (5). On average, life reduces by 5-10 years.

The cascade of the immune reactions result from the interaction of genetics and environmental factors, leading ultimately to synovitis, joint damage and structural bone damage. Thus causing functional disabilities. Multiple joints are attacked in arthritis, affecting the joints bilaterally similarly mostly the small joints as such finger joints (middle and large knuckles), base of the thumb, wrist, elbows, knees, ankles or feet. Further the extra articular manifestations and comorbidities result in increased mortality of patients with RA (5).

RA has seven diagnostic identified criteria according to the American College of Rheumatology 1987. The criteria have a sensitivity and specificity of approximately 90%.at least four of the following criteria from the seven must be met (13):

- Morning stiffness in and around joints which lasts for 1 hour or more before maximal improvement (must have been present for at least 6 weeks).
- Soft tissue swelling (arthritis) of three or more joint areas. (Right or Left: MCP, PIP, wrist, elbow, knee, ankle, MTP), (must have been present for at least 6 weeks).
- Swelling (arthritis) of the proximal interphalangeal, metacarpophalangeal, or wrist joints (must have been present for at least 6 weeks).
- Symmetrical arthritis (must have been present for at least 6 weeks).
- Subcutaneous nodules.
- Positive test for rheumatoid factor, in <5% normal population.
- Radiographic erosions and/or periarticular osteopenia in hand and/or wrist joints (5).

The American College of Rheumatology and the European League Against Rheumatism collaborated to develop new classification with the goal of improving the sensitivity and specificity of early RA. It consists of following four domains for composite scoring system (10).

Criteria	Score
A. Joint Involvement	
1 large joint	0
2 – 10 large joints	1
1 – 3 small joints	3
>10 joints (at least 1 small joint)	4
B. Serology	
Negative RF and anti-CCP	0
Low-positive RF or anti-CCP	2
High-positive RF or anti-CCP	3
C. Acute-phase reactants	
Normal CRP and ESR	0
Abnormal CRP or ESR	1
D. Duration of symptoms	
<6 weeks	0
≥6 weeks	1

Table 2 2010 RA classification criteria (10)

2.5. Differential diagnosis

Rheumatoid arthritis can resemble any disorder causing acute or chronic polyarthritis. Acute diagnosis of RA can be particularly challenging. There are lots of disorders that mimic RA (10, 20, 31).

- Osteoarthritis by careful history and examination can be easily differentiated from RA. The absence of systemic inflammatory signs and symptoms, onset later in life and the pattern of joint involvement help in distinguishing the two disorders. OA with severe deformities of hands from bony proliferation of the DIP and PIP joint, instead of soft tissue and joint abnormalities (10, 20, 31).

- Infectious arthropathies is a consideration in setting of fever and polyarthritis. Bacterial arthritis is suspected, joint aspiration and synovial fluid cultures and blood cultures are helpful in diagnosing (10, 20, 31).

- Lyme disease associated with negative synovial fluid cultures.

- Seronegative spondyloarthropathies- muscle weakness and antibodies associated with the following disorders are readily distinguished from RA; reactive arthritis, ankylosing spondylitis, inflammatory bowel disease – associated arthropathy.

- Fibromyalgia diffuse symmetrical arthralgia and stiffness is present at rest. However it does not present with synovitis, lack of motion pain and normal laboratory and imaging studies (10, 20, 31).

2.6. Manifestation of Rheumatoid arthritis

2.6.1. *Specific Joints manifestation*

In RA, role of synovitis principles is applicable to all joint destructions. Nevertheless, certain aspects are pertinent to specific joints mainly the small joints for instance, MCP, CMP, PIP etc. the large joints are afflicted too causing more seriousness of the disease. Characteristics is palpated joint pain and swelling, warm to touch and limited joint mobility (13, 28).

Cervical spine: is more commonly involved, than the thoracic and lumbar spine. Tenosynovitis of transverse ligaments due to inflammation and subluxation of the atlas may produce significant instability of C1-C2. The inflammatory process involves diarthrodial joint and is neither palpable nor visible. This manifests painful sense of Cervicocranial or Cervicobrachial syndrome. Neck stiffness through the entire arc of motion is found primarily and restricted ROM develops. Osteoporosis results in fractures; affection of intervertebral discs and spinal joints may be present too (13, 28).

Shoulder: involves mostly the sign of disease progression but the strain can vary widely. The shoulder capsule lies beneath the muscular rotator cuff, an effusion is difficult to detect. Thus the swelling is not often detected. Destruction of humerus head, glenoid cavity and often sub-chromium- exchanges are present. Strong resistive flexion could rupture the tendon of long bicep. Often affected the tendon of rotator cuff causes the subluxation of the humeral head. Limited motion and function of shoulder results in Frozen shoulder syndrome. Symptoms are worse at night (13, 21).

Elbow: inflammation is easily detected, due to the joint superficiality; synovitis is evident by palpation and thickening of radio humeral joint. Humeral ulnar junction destruction leads to radial head being moved proximally and thus blocking the flexion and extension. Lateral pain is limited with limited supination and crepitus. Olecranon bursitis and neuropathies may develop (13, 21).

Wrists, join of hands and fingers (Figure 3):

- Swelling predominantly around styloid process of ulna.
- Limited wrist flexion.
- Supination-subluxation deformity – when wrist rotates around dorsal ligaments.

- Carpal tunnel syndrome.
- Metacarpal phalangeal (MCP) and proximal phalangeal (PIP) involvement is common, but the distal interphalangeal (DIP) joints usually are spared.

- Ulnar deviation of MCP due to joint destruction
- Radial deviation at wrists due to joint destruction

- "Z" deformity of thumb
- Interosseous muscle atrophy
- Tendon Ruptures - most common Extensor Pollicus Longus



- Rheumatoid Nodules along tendon sheaths
- Swan-neck deformities - flexion in MCP, hyperextension in PIP, flexion in DIP joints.

- Nodular thickening along flexor tendons of the palms
- Boutonniere deformities- flexion in PIP, hyperextension in DIP joints (13, 21).

Hip: Coxarthrosis of the hip joint is common leading to hip joint replacement surgery. It manifests groin pain radiating to the thigh. Limited ROM dysfunction is first noticed when the patient has difficulty in ADL like putting on shoes on the affected side, since it is poorly diagnosed. Often bursitis of muscle iliopsoas is present (13, 21).

Knee: easy detection of the knee effusions and synovial thickening on examination. Baker's cyst, leads to limited knee extension with warm inflamed joint and patient feeling restless. The synovial fluid leakage in to the popliteal exchange between the heads of muscle Gastrocnemius, loosening and descending to the ankle joint. Flexion with valgus and external rotation of tibia and posterior subluxation of tibia occurs (13, 21).

Foot and ankle joints: greater dysfunction and pain because it's the weight bearing joint structure (Figure 4):

- Lateral deviation of 1st toe
- Claw or hammer toes



Figure 4 RA foot deformity (4)

- Pronation and eversion of foot
- Tarsal tunnel involvement resulting in burning paraesthesia
- Lower extremity involvement leads to greater dysfunction and pain due to weight bearing role.
- Widening of forefoot (Metatarsophalangeal) joints

- Dropping of metatarsal(MT) heads
- Distal displacement of MT fat pads (13, 21)

2.6.2. Systemic effects.

RA affects the entire body, but most often the joints; organs and other body systems are affected too. Inflammation of blood vessels – vasculitis causes compromised circulation of the hands, feet and nerves. Eye conditions are developed in with people often with RA, such as Keratoconjunctivitis sicca or dry eye, it causes redness, burning, itching, reduced tearing and sensitivity to light.

Furthermore, complications of respiratory, cardiovascular, gastrointestinal, infectious, neurological and haematological disorders are developed too. Exceptionally, the uppermost vertebrae ligaments are damaged which supports the skull, causes the vertebrae to slip out of alignment and compress the spinal cord.

Overall, ADL are affected of a RA patient such as dressing, bathing, walking and hand grips (9).

2.6.3. Neurologic manifestation.

RA demonstrates neurologic complications, the most common are compression neuropathies, particularly compression of the wrist median nerve which is known as Carpal Tunnel syndrome and ulnar nerve compression at the elbow or wrist. Mononeuritis multiplex and a mixed motor-sensory peripheral neuropathy is caused due to rheumatoid vasculitis. Cervical myelopathy and brainstem compression can produced by atlantoaxial subluxation and basilar invagination. RA causes an unusual complication which is pachymeningitis-inflammation and thickening of dura mater-which presents as clouded sensorium, cranial nerve abnormalities, and retardation of motor activity (15, 10).

2.6.4. Renal manifestation.

Kidneys dispense with RA and renal impairment in RA patients is due to often drug toxicity (such as NSAIDs) or to comorbidities like hypertension or diabetes mellitus. Although, rare cases of pauci-immune, necrotizing crescentic glomerulonephritis complicating RA in patients usually with P-ANCAs and evidence of renal vasculitis. A rare complication of renal amyloidosis is also found (15, 10).

2.7. Physician examination and diagnostic methods of rheumatoid arthritis

I. Imaging tests for rheumatoid arthritis

Rheumatoid arthritis often involves the hands and feet joints; the initial evaluation by the doctor is usually the x-rays taken to reveal the signs of joint involvement for inflammation and damage as bone erosion. Other useful imaging tests are useful too (28, 32):

- Plain radiography (X-rays) indicates clear results in the earlier stages of RA, but only soft tissue swelling or joint effusion visible. This test helps in establish prognosis, assessing joint damage longitudinally and when surgery is appropriate. As disease progresses, characteristic findings of RA are included: soft tissue swelling, juxta articular osteopenia, concentric or symmetric loss of articular cartilage with diminution of the joint spaces and bony erosions (28, 32).

- Magnetic resonance imaging (MRI) is more sensitive imaging technique than plain x-rays and is more useful in detecting changes in joints and related structures resulting from inflammation. It also provides superior details in description of articular and periarticular structures. It useful in detecting thickening of synovial tissues or cysts leading to swelling of bone marrow that predicts later bone erosion. The drawback is that MRI is expensive and routine use of it could drive up the cost for the people with RA dramatically (21, 32).

- High resolution ultrasonography (ultrasound), it is more widely used modality than MRI for assessment. It can detect bony erosion in RA patient with greater sensitivity than the x-rays or MRI. Hands joints synovial fluid and thickened synovial tissue can be readily detected (28, 32).

II. Laboratory test

- Synovial fluid analysis in RA is usually yellowish, turbulent or cloudy synovial fluid and due to its inflammatory nature is has low viscosity and poor stringing effect. Inflammatory cell counts varyingly range with leukocyte count from 2,000 to 75,000 cells/mm³, differential counts on rheumatoid synovial fluid show a predominance of neutrophils (usually > 70 %). RA patients are at greater risk of infectious arthritis, them presenting with an acute monarthritis flare or chronic recalcitrant monarthritis should undergo synovial fluid aspiration and analysis to exclude acute bacterial infections or chronic fungal or mycobacterial infections. For crystal analysis the polarized microscopic examination should be negative as there is a negative association between gout and RA (5).

- The erythrocyte sedimentation rate (ESR) provides a measure of body-wide inflammation. Its higher rate could lead to inflammatory suffering caused by RA. It helps in determining the condition prognosis (5).

- The C-reactive protein (CRP) test also measures inflammation, but tends to change more rapidly than the ESR. Its minor elevation is associated with an increased risk of cardiovascular disease. No clear advantages of assessing inflammation by RA is offered than the ESR (5).

- Rheumatoid factor an abnormal antibody is found in the blood of 70% - 80% RA people. However, only about 10 % of people detected with the rheumatoid factor in their blood are diagnosed as RA. These people might be healthy or may be suffering from another disorder such as systemic lupus erythematosus. Also, some people with RA will test negative for rheumatoid factor. Therefore the additional blood test must be done to look for the causes of joint pain (5).

- The CCP antibodies test measures the presence of an antibody associated with RA. The anti-CCP test is gradually being common. CCP test according to some studies indicate that it is reliable in diagnosing rheumatoid arthritis in three types of people. Firstly, people with early stage disease for whom uncertainty remains about diagnosis; secondly, people with mild symptoms whose test negative for rheumatoid factor; and thirdly people who test positive for rheumatoid factor but may suffer from some condition (5).

III. **Arthroscopy** (arthroscopic surgery) is an invasive surgical procedure in which examination and treatment of the damage interior of the joint is performed using an arthroscope. It is a type of endoscope that is inserted into the joint through a small incision. Many orthopaedic conditions can be evaluated or treated by arthroscopic procedures for torn floating cartilage, torn surface cartilage, ACL reconstruction, and trimming damaged cartilage. The advantage to arthroscopy is that the joint does not have to be completely opened comparably to traditional open surgery. Two small incisions are made – one for arthroscope and one for surgical instruments. Thus the recovery time is reduced and may increase the rate of surgical success due to less trauma to the connective tissue (18).

2.8. Conservative and Non- conservative therapy by the physician

I. Conservative:

- Non-steroidal anti-rheumatic drugs help in reducing the signs and symptoms of established inflammation but do not eliminate the underlying cause of it. After promptly being absorbed into the blood it effects the pain, swelling, heat, erythema and loss of the function is fully evident within a few weeks. With exacerbation of signs and symptoms of inflammation drug withdrawal is quickly followed. However, the drugs do not affect the course of the basic disease process and does not protect against tissue or joint injury; therefore, joint damage continues to occur during the administration of non-steroidal anti-rheumatic agents to patients with chronic inflammatory arthritis (5, 6). Non-steroidal anti-inflammatory drugs (NSAIDs) include aspirin and the non-acetylated salicylates, phenylbutazone, indomethacin, ibuprofen, fenoprofen, ketoprofen, flurbiprofen, naproxen, tolmetin, sulindac, meclofenamate, diclofenac, ketorolac, etodolac, diflunisal, nabumetone, oxaprozin, and piroxicam (5, 6). Both adverse and beneficial effects are tend to be NSAIDs dose-related; requiring careful evaluation of risk/benefit ratios. Important toxicities occur in the gastrointestinal tract (GI), central nervous system, hematopoietic system, kidney, skin and liver. According to Chrono pharmacologic studies the adverse effects of NSAIDs can be minimized by adjusting the time of drug dosage administration (5, 6).

- Corticosteroids are potent suppressors of inflammation, it is effective in managing the pain and functional limitations of people with active inflammatory joint disease. Oral therapy of corticosteroids for RA is desirable, however adverse effects may trigger by alternating the fat distribution. It may also influence glucose, protein and electrolyte metabolism and hepatic enzyme function resulting in a tendency toward hyperglycaemia and insulin resistance , protein catabolism in muscle and bone, sodium retention and potassium loss. Long term use is generally avoided because of the side effects of these drugs (13).

- Disease-modifying anti rheumatic drug (DMARDs) action mechanisms differ greatly, such as for biologic response modifiers as the TNF-a antagonist. Great variation in the chemical structure, toxicity and indication for the use of DMARDs is present. Its effectiveness prevents joint erosions and damage, it controls the active synovitis and constitutional features of the disease. In short term clinical trials the goals are achieved by DMARDs and in long term observational follow-up according to evidence. However, studies haven't proved that DMARDs can heal erosions, reverse joint deformities or cure it (13).

II. Non-conservative:

Inflammatory arthritis could be managed by the surgical management of the patients, as opposed to an isolated event in the disease process. Positively the goals of surgical intervention leads to achieving the relief of pain and to maintain and improve the function. Functionally maintaining and improving the patient's ambulation to surgery directed at improving the patient's ability to perform ADL (13).

RA patients are the most important member of the non-conservation treatment team. They know the problems they're having and how is it affecting their lives. Along with professional team members: the orthopaedic surgeon, nurses, rheumatologists, social workers, therapist and the patient; overall with specialist skills. Enthusiastic active involvement of the patient helps the team to provide short and long term treatment plans relevant to the patient's needs and personal beliefs. The integration leads to improving outcomes and compliance to the treatment plan of the patient suggested. The surgical procedures for rheumatoid arthritis are arthroscopy, synovectomy (removal of the inflamed tissue that lines the joint) and arthroplasty (joint repair, including joint replacement).

Total joint replacement are mostly common for hip or knee arthritis, many associated risks are present since it's a major operation (13).

The cervical spine, hand and wrist joints, ankle and foot, hip and knee joint and elbow and shoulder joint are the most common surgical interventions (6).

Mostly postoperative managements are roles of physiotherapist along with other rehabilitative therapist, but it has not been clearly defined in studies. The requirements of the therapy varies from joint to joint. Post-operative exercise program will improve muscle strength, increase motion and educate the patient in activities of daily living and in the proper protection of operated and non-operated joints (6, 12).

2.9. Physiotherapy examination of rheumatoid arthritis

Joint abnormalities in structure and functions are general aim of the examinations. Swelling, enlargement, tenderness, ROM limitation, crepitation, deformity and instability are the common signs of articular diseases (12).

- Instability of joint occurs when the joint normal movement is greater than normal in any plane. Partial displacement of the articular surfaces in a joint with less surface-to-surface contact is referred to as Subluxation. Determination of joint instability by the physiotherapist is elaborated when the joints are supported between two hands and stresses the adjacent bones in direction in which the normal joint does not move (12,27).

- Deformity is manifested by the bony enlargement, articular subluxation, and contracture or ankyloses in non-anatomic positions of the joint misalignments. Restricted movement of the joints with pain is demonstrated (12, 17).

- Crepitation is an audible palpable grating sensation produced by motion. It occurs due to roughness of the articular or extra articular surfaces when rubbed together during movement (12, 17).

- Limited ROM is manifested. Comparison of the affected joint with the unaffected extremity helps in evaluating the individual variations. Often passive ROM is greater than the active ROM in patients with articular diseases; due to pain, weakness or the state of periarticular structures. Joint tenderness is assessed when stress passive joint motion at the extremes of flexion and extension is done (12, 17).

- Tenderness is an unusual sensitivity to touch or pressure when localized with palpation to determine the pathologic site in intra-articular or periarticular, such as in fat pad, tendon attachment, ligament, bursa, muscle or skin. Significant tenderness can be assessed by useful palpation of the non-involved structures (12, 27).

- Bony enlargement of joints with swelling has hard feeling when palpated and not tender. Typically found in osteoarthritis, however could be found in RA as well (12, 17).

- Swelling is produced by the inflamed synovial membrane. It demonstrates the sensation of tightness or restriction at the joint and may be tender. Soft to touch or “boggy” feeling is more expressive. Excessive joint fluid is marked by swelling, a sign of inflammation or could be bleeding into the joint (12, 17).

2.10. Conservative therapy by the physiotherapist

➤ In acute stages (7) :

- Patient education
- Cold applications
- Local and general rest
- Splints
- ROM exercises

➤ In chronic stages (7) :

- Walking and standing re-education
- Passive movement
- Active assisted movements
- Active movements

I. Joint protection Strategies

- Rest and Splinting – to prevent the development of deformities orthosis and splints are used.

- Therapy gloves – helps in improvement of hand grip strength. Also helps in to control and manage the hand pain, improves the hand function and psychologically relaxes the wearer.

- Compression gloves: consequently reduces the pain and moderate joint swelling.

- Assistive devices and adaptive equipment - to facilitate the activities of daily living (elevated toilet seats etc.) mostly provided by the occupational therapist (20).

II. Manual massage therapy

It triggers improved function, pain reduction of the articular focused movement, reduction of disease activity improve flexibility and welfare dimension of depression, anxiety and pain (20).

III. Therapeutic Exercises

According to evident studies exercise helps in improving general muscular endurance, mobility and function, and strength without further damages of the RA. The aim is to improve daily functioning and social integration for RA by mean of improvement of strength, aerobic condition, range of motion, stabilization and coordination (20).

- Range of motion exercises – isometric / static exercises for acute stage; isotonic exercises for chronic stage; to increase the mobility of the joint without concerned load on the joint. (e.g. – MCP flexion, tendon glide, finger radial walking, wrist circumduction, finger adduction etc.) (20).

- Stretching exercises in acute stage (20).

- Strengthening exercises – isometric, isokinetic and isotonic. (E.g. – eccentric wrist extension, gross grip, finger adduction, pinch grip etc.) (20).

- Aerobic condition exercises – intensive and moderate intensive to improve muscle endurance and aerobic capacity (20).

- Stabilizing and coordination exercises – to stimulate the sensorimotor system (20).

- Routine daily activities – SARAH (Strengthening and stretching for rheumatoid arthritis) to increase strength, dexterity and ROM; exercises against resistance with therapy putty, Thera band or hand exercise balls (20).

IV. Endurance activities

- Yoga provides pain relief, relax stiff muscles and ease sore joints. The controlled movements, pressures, stretches and deep breathing relaxation influences the ROM. Caution to be taken to avoid excess torque or pressure on the joints (16).

- Static cycling with less stress on joints (16).

- Walking for muscle strength and flexibility, as well mobility. It helps in bone health (16).

- Swimming in water is an excellent way to increase muscle strength, relax sore muscles, improve joint stability and ease its stiffness. Water buoyancy property is less stressful on joints (16).

V. Physical Therapy modalities

The main aim of the modalities is to lessen the inflammation and pain; should be goal specific and time limited. Superficial heating as such hot water bottles, hot packs, hydro collator packs, paraffin wax, heating pads, heated pools, whirlpools and infrared lamps are common. Heat modalities could help in reducing the symptoms. Other the other hand, cold modalities during acute inflammation may help in reducing it by raising the pain threshold and produce local analgesia, lower spasticity and the muscle spasms by directly influencing the muscle spindles. The cold modalities include ice packs, ice massage, cold packs and fluorotherapy (7, 20).

For electrotherapy transcutaneous electrical nerve stimulation (TENS) method is primarily aimed to provide relief of symptomatic pain by superficially exciting sensory nerves and therefore stimulating either the gate pain mechanism or the opioid system. TENS is non-invasive and comparably has less side effects to drug therapy. It may trigger allergic type skin reaction in about 2-3% of patients, due to electrodes material, conductive gel or the tape employed to hold electrodes in place (7, 20).

VI. Educating the patients

Orthotic descriptions are authorized by the responsible physicians. Physiotherapist is responsible for evaluating the patient's balance, joint excursions, motor power, skin condition, and current and potential function; along with educating the patient how put on and take off the orthosis, using the correctly and maintaining it. Educating to protect the joints, information about their condition and different therapies disposed to improve the quality of their life. Adjustment to movement behaviour of the patient helps in the patient becoming more active (7, 20).

2.11. Other therapies

- Occupational therapy – ergotherapist helps in training of self-sufficiency and autonomy of everyday activities by teaching how to use individual compensatory technical aids that facilitate various activities. It raises awareness of illness and help patient in making significant contribution to slow down or avoid irreversible changes that affect not only the musculoskeletal system but also overall health (25).
- Cognitive Behavioural therapy – to enhance long term maintenance of the RA patient. Presenting with pain coping skills, maintaining initial improvements in pain and disabilities (22).
- Acupuncture – helps in relieve pain due to RA. It seems to help releasing endorphins, a natural morphine like chemical in the nervous system (25).

3. Case Study

3.1. Methodology

The clinical practice for the case study report based on the physiotherapeutic approach for the patient diagnosed with Rheumatoid Arthritis was practiced under professional guidance at the Institute of Rheumatology in Prague from 15th of January till 26th of January 2018.

The patient assigned for the report was diagnosed for seronegative rheumatoid arthritis recently this year. The patient was hospitalized only for ten days at the hospital, for observation and required examinations; therefore only six sessions of the therapy were done with the patient but with enough time to provide proper required therapy on necessary areas that required attention with caution.

Initial Kinesiology examination took place on the first day of meeting followed by initial therapy program. The final kinesiology examination was performed after the final therapy session on the 25th of January 2018. In total 6 therapy session each for 45 to 75 minutes.

All measurements and therapies took place in the gym, where it was possible to use a positioning deck and other aids like over ball, foam ball, balance boards, positioning wedges and cylinder, spiky balls and Thera bands. For examinations measuring tape, goniometer, finger goniometer, plumb line and neurological hammer were used. Physiotherapeutic methods and techniques that were used in the therapy were Lewit soft tissue techniques, Janda stretching PIR, Lewit PIR, shortened muscle stretching, Lewit joint play mobilization, Kabat PNF, exercise training, gait and balance training with sensorimotor stimulations.

The patient was informed about her participation in therapy for the completion of the bachelor's thesis, in which she gave her consent; along she was informed that I am student but will be working under the guidance of supervisor Mgr. Markéta Mikulášová. The ethics' Committee of Charles University, Faculty of Physical Education and Sports, have approved the thesis work with the approval number: 040/2018

3.2. Anamnesis

Examined person: K.K

Date of birth: 7.5. 1946

Gender: Female

Diagnosis: Rheumatoid arthritis

3.2.1. Status Presences:

Objectively

- **Height:** 170 cm
- **Weight:** 97 kg
- **BMI:** 33.5
- **Pain Level :** 6/10
- **Blood Pressure:** 152/84mmHg
- **Assistive devices:** Single limb walking stick

Subjectively

- **Chief Complaint:** Pain in wrist and fingers bilaterally especially when lifting or holding things, more painful on the right. Feels pain in hip joint, knee both and at cervical spine. Pain intensity increases at night. Morning stiffness for max. 30 minutes. Does not have any sensation or feel muscle activation on the lower extremities below the knee, especially on the foot after the Lumbar surgery.

- **Present Anamnesis (diagnosis):** Seronegative rheumatoid arthritis was diagnosed in June 2017. Polyarthritis of hand's small joints .Generalized osteoarthritis: Coxarthrosis I bilateral, Gonarthrosis I – II bilateral.

- **Injuries / Past medical and surgical history:** K.K suffered from rheumatic fever occurrence at the age of 14 years. . Treated for anxious depressive syndrome 12 years ago. Has Arterial hypertension, Stenosis of the carotid artery, hyperuricemia, chronic bronchial asthma insufficiency. Had 2 Lumbar spine vertebrae operation (Laminectomy) one in 2009 L4/ L5 and another in 2011 L5/S1; suffered from carpal tunnel syndrome and had the operation in 2015 for the left and 2016 for right. After visceral vein surgery bilaterally in 1982, she had laparoscopic hysterectomy with adnexectomy at the age of 38 years after prolonged bleeding.

- **Pharmacological Anamnesis:** Methotrexate – 10 mg till 6/2017, since increased to 15 mg. Glucocorticoids 4 mg since 6/2017.
- **Allergic Anamnesis:** Aspirin, it causes stomach and head aches
- **Gynaecological Anamnesis:** Mammography in 2016, UPT x 1, Laparoscopic hysterectomy with adnexectomy in 1982
- **Abuses:** None
- **Diet:** weight reduction diet + protein diet.
- **Family Anamnesis:** One of the sister died as a child due to some injury in the brain. Another, sister had dysplasia. Mother died at the age of 86 years, she had coxarthrosis, dysplasia, hypertension, diabetes and Alzheimer. Father died at the age of 76 due to TBC in concentration camp, she had Angina pectoris too. K.K has two daughters – the elder one has endocrinological tumour on the pituitary gland and underwent surgery for it; she developed arterial hypertension. The other daughter only suffers from asthma.
- **Social / Functional Anamnesis:** Living with her husband and daughter in an apartment.
- **Occupation Anamnesis:** Receptionist at a residential complex.
- **Sport, regular physical activity:** Nordic walking twice a week for an hour.

3.2.2. Previous Rehabilitation:

Patient followed rehabilitation program in the past (8 years ago) after Laminectomy, extensive degenerative changes of L4 / L5 and L5 / S1.

3.2.3. Medical Documentation Statement:

Doctor's objective finding of KK

- Diagnosed in 2016 acute malignancy at the metacarpal phalangeal joints. Deteriorated from March 2017, becoming worse in the night and suffers from morning stiffness for about 30 minutes and sometimes longer.
 - Since June she suffered from breathlessness, the condition improved by the use of inhalers.
 - Abdominal pain and vomiting was experienced only at the beginning of methotrexate usage, now tolerates well.
 - Swirling dermatomes observed on the lower limbs, so occasionally she is advised to wear compression stockings.
 - Due to Sicca syndrome it causes cloudy visions and dryness in the eyes. Increased hair loss and nail discomfort.
 - Finger colour changes from nails resulting in positive Raynaud's disease.

X-RAY (15th January, 2018)

- Cervical spine: Normal lordosis of the first 3 cervical vertebra, reduced C4 and C6 with localized spondylolysis, spondylosis occurrence dorsally.
- Thoracic spine: porosis; hyper kyphosis; wedge – shaped vertebral deformity at the top of the kyphosis, clinically deformed, ventrally remodelling spondylolysis.
- Lumbar spine: Scoliosis towards the left, hyper lordosis, State after operation L3 to L5 area has metal buckles with several screws, porosis.
- Hip: Left osteophyte head is remodelled, bilaterally arthrosis.
- Heart & Lungs: the gates are arched, the angles are loose. Transparency of both lung, pulmonary parenchyma without bearing or infiltrative changes. Reasonable broncho vascular visibility. Normal size and configuration of the heart.
- Mediastinum is in the middle and not distorted.
- Sacro iliac joint: - asymmetrical and structural changes observed.

3.2.4. Rehabilitation Indication

- Maintain the Range of motion, especially of the hands and feet.
- Improve the strength of weak muscles.
- Relax high toned muscles.

3.3.Initial Kinesiology Examination

3.3.1. Observation

- Overall the body is shifted to the left.
- Trunk ante flexion.
- Deformity observed at the metacarpal joints bilaterally and slight swelling on the first interphalangeal joint.
 - Right hand flexion is limited, difficulty on having a firm grip.
 - Right thigh is wider and slightly swelled.
 - Bilateral calf, ankle and foot muscles are swollen.
 - Hammer toes observed with hallux valgus bilaterally.

3.3.2. Postural Examination (Static)

POSTERIOR VIEW		
The base support		Wide base of support, the distance between the heels in less than the length of the foot, the weight is normally distributed.
Shape and contours of the heels		Symmetrically rounded heels
Shape and position of the ankle joints		The left medial malleolus contour is prominent than left.
Contour of the calf muscle		Left calf muscles are wider than the right.
Knee Joints		Valgus
Popliteal line		Right is wider in length and laterally the higher than left. Both are medially downwards
Contour of the thigh muscles		The left is wider than the right.
Sub gluteal line		Right is wider and visible.
Gluteal muscles		Atrophy of gluteal muscles, more of the left.
Position of the Posterior Superior Iliac crest		The right is about 2cm higher than the left (<i>on Palpation</i>)
Symmetry of thoracobrachial triangles		Present only on the left.
Curvature of the spine in frontal plane	Cervical Vertebrae	Normal lordosis of the upper cervical, hyper kyphosis from C4 till C6
	Thoracic Vertebrae	Hyper kyphosis of the from TH1 to TH3, convexity from TH 8 to TH 12
	Lumbar Vertebrae	Scoliosis towards left at L1 to L3, normal lordosis curve at L4 – L5.
Position of the scapula		Right scapula is abducting outwards and the inferior angle is prominent.
Position of the shoulder girdle		Right shoulder is lower than left.
Upper limb		Symmetrical same length.
Position of the head		Towards the left.
Trunk		Upper body is shifted to the left.

Table 3 Posterior Posture View

LATERAL VIEW	
Contour of the thigh muscles	Left is Posteriorly wider & prominent.
Contour of the calf muscle	Left muscles below the knee is prominent posteriorly.
Position of the knee joints	Both knees are extended with left more than the right.
Position of the pelvis	Ante version
Position and curvature of the Spine	Hyper Kyphosis from C4 till TH2
Shape of the abdominal muscles	Protruding belly outwards and forward down.
Position of the elbow	Both elbows are flexed with the right more.
Position of the shoulder girdle	Protracted shoulders
Position of the head	Protracted head.
Position of the trunk	Protracted / ante flexed
Hand / fingers	The fingers are semi flexed, the index finger of the right is in abducted position.

Table 4 Lateral Posture View

ANTERIOR VIEW	
Foot arches	Symmetrically normal
The position and shape of the toes	Hammer toes observed on both. Hallux valgus of both big toes.
Position of the foot	The foot is externally rotated (hip External rotation)
Contour of the calf muscles	Right is wider than left.
Shape and position of the knee joints / Patella	Left knee is lower than right; both knees are demonstrating valgus.
Shape of the thigh muscles	Right is wider than the left.
Anterior superior iliac spine	Right is slightly higher.
Symmetry of the thoracobrachial triangles	Left below the elbow is visible only.
Position of the shoulder girdle	Right shoulder is lower.
Upper limbs	Right arm is lower/longer than left.
Position of the head	The head is tilted to right.

Table 5 Anterior Posture View

3.3.3. Pelvis Palpation

Height and symmetry of Iliac Crest	Right iliac crest is about 2 cm higher than left.
Posterior Superior Iliac Spine (SIPS)	Right is slightly higher
Anterior Superior Iliac Spine (SIAS)	Right is slightly higher
Pelvic rotation/ torsion/ twisted	Slight tilt of the pelvis
Ante version (anterior tilt) or Retroversion (posterior tilt)	Ante version

Table 6 Pelvis Examination

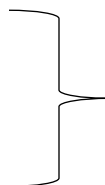
3.3.4. Assessment of Breathing Stereotype pattern

The patient is observed using the abdominal part for breathing more than the middle (lower ribs part); the upper chest (clavicular), same in supine, sitting and standing position.

3.3.5. Specific Testing

a) **Romberg test**

- **Test 1** Normal
- **Test 2** Loses balance
- **Test 3** Loses balance



The test is positive, loses balance immediately after standing with feet together and eyes closed.

b) **Vele Test**

Grade 3 on the right and Grade 4 on the left.

3.3.6. Anthropometric Measurement

Circumference of the thorax during Inhalation and Exhalation (sum up)	
Upper chest (around the axilla)	2.5 cm
Mid sternum	3 cm
Height of xiphoidal process	1.5 cm

Table 7 Chest Circumference

LEFT		RIGHT
77 cm	Length of the whole upper extremity (measured from the acromion to the tip of third finger)	76 cm
97cm	Anatomical length (supine position, from major trochanter to lateral malleolus)	96cm
107 cm	Functional length (umbilicus to the medial malleolus)	105 cm
99 cm	Functional length (from the anterior superior iliac spine to the medial malleolus)	99 cm
59 cm	Circumference of the thigh (testing the quadriceps muscle, is measured 15cm above the knee cap)	60 cm

Table 8 Anthropometric

3.3.7. Spinal Distances

Thomayer's Distance	1 cm	
Shober's Distance	6 cm	
Stibor's Distance	8 cm	
Lateral Flexion	Left – 20 cm	Right – 21 cm
Cepojev Distance	4 cm	

Table 9 Spine Distances

3.3.8. Gait Analysis

GAIT	
Width of the base of support.	Wider base
Walking Rhythm	Ideal
Walking speed	Slow pace
Stride length	Asymmetrical, right leg takes smaller step forward than the left.
Movement of the foot.	<ul style="list-style-type: none"> • Heel strike – Ideal • Flat foot – the entire foot touches the ground. • Loading response - ideal • Heel off - Ideal • Toe off – Using more of the metatarsal joints.
Position and Movement of the knee and hip	Ideal flexion of the knee & hip joint; limited hip extension more on the right.
Position and movement of the pelvis.	Ideal sway of pelvis laterally lateral.
Position and movement of the trunk.	Trunk ante flexion and rotating towards the left.
Position and movement of the upper extremity.	Shoulder movement is not very pronounced on the right, but normal arm sway on the left. Bilateral elbows are semi flexed.
Position of the head.	Head is protracted and downwards.
Stability of walking.	Patient walks with body leaning more towards the left.

Table 10 Gait

MODIFICATION OF GAIT ANALYSIS	
Walk on the narrow base.	Patient loses balance after 3 steps.
Walk on soft surface.	Patient walks normally.
Walk with eyes closed.	Patient loses balance after 2 steps.
Walk backwards.	Patient deviates towards the left side, with limited hip extension bilaterally.
Walk up steps.	Walks ideally.

Table 11 Modified Gait

3.3.9. ROM Goniometer Measurements & End Feel. (Janda Approach & SFTR format)

SHOULDER	ACTIVE [°]		PASSIVE [°]	
	<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion	S: 30-0-100 Painful Flexion	S: 30-0-120 Painful Flexion	S : 30 - 0 - 110 Painful Flexion	S: 30 - 0 - 110 Painful Flexion
Abduction	F : 90, Painful	F:70,Painful	F : 100,Firm	F:90,Painful
Horizontal Abduction & Adduction	T : 30 - 0 - 110	T : 30 - 0 - 110	T : 30 - 0 - 110	T : 30 - 0 - 110
External & Internal Rotation	R : 30 - 0 - 75 Painful External	R : 30 - 0 - 70 Painful External	R : 40 - 0 - 90 Firm	R : 40 - 0 - 90 Firm

Table 12 Shoulder ROM

ELBOW	ACTIVE [°]		PASSIVE [°]	
	<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion	S : 0 - 0 - 140	S : 0 - 0 - 140	S : 0 - 0 - 140	S: 0 - 0 - 140
Supination & Pronation	R : 90 - 0 - 80	R: 90 - 0 - 80	R : 90 - 0 - 85	R : 90 - 0 - 90

Table 13 Elbow ROM

WRIST & FINGERS		ACTIVE [°]		PASSIVE [°]	
		<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion		S : 45 – 0 – 75 Painful Extension	S : 35 – 0 – 70 Painful Extension	S : 65 – 0 – 75 Painful Extension	S : 60 – 0 – 70 Painful Extension
Radial & Ulnar Duction		F : 10 – 0 – 12	F : 10-0-10 Painful Radial duction.	F : 10 – 0 – 12	F : 10 – 0 – 10 Painful Radial duction.
Metacarpophalangeal Joints Extension & Flexion	1 st	S: 0 – 0 – 15 Painful Flexion	S: 0 – 0 – 10 Painful Flexion	S: 0 – 0 – 20 Painful Flexion	S: 0 – 0 – 10 Painful Flexion
	2 nd	S: 10 – 0 – 85	S: 10 – 0 – 80	S: 10 – 0 – 85 Painful Flexion	S: 10 – 0 – 80 Painful Flexion
	3 rd	S: 10 – 0 – 85	S: 10 – 0 – 80	S: 10 – 0 – 85	S: 10 – 0 – 80 Painful Flexion
	4 th	S: 10 – 0 – 85	S: 10 – 0 – 80	S: 10 – 0 – 85 Painful Flexion	S: 10 – 0 – 80 Painful Flexion
	5 th	S: 10 – 0 – 85	S: 10 – 0 – 80	S: 10-0-85 Painful Flexion	S: 10-0-80 Painful Flexion
Thumb (1st) Carpometacarpal & Metacarpophalangeal Joints Abduction & Adduction	1 st	F: 20-0-25	F: 20-0-25	F: 20-0-25	F: 20-0-25
	2 nd	F: 20-0-10	F: 10 - 0 - 5	F: 20-0-10	F: 20-0-10
	3 rd	F: 20-0-10	F: 10 - 0 - 5	F: 20-0-10	F: 20-0-10
	4 th	F: 20-0-10	F: 20-0-10	F: 20-0-10	F: 20-0-10
	5 th	F: 20-0-10	F: 20-0-10	F: 20-0-10	F: 20-0-10
Interphalangeal Proximal joint Extension & Flexion	1 st	S: 0 – 0 – 40	S: 0 – 0 – 20 Painful Flexion	S: 0 – 0 – 40	S: 0 – 0 – 20 Painful Flexion
	2 nd	S: 85 – 0 – 0	S: 85 – 0 – 0	S: 90 – 0 – 0	S: 90 – 0 – 0
	3 rd	S: 85 – 0 – 0	S: 85 – 0 – 0	S: 90 – 0 – 0	S: 90 – 0 – 0
	4 th	S: 85 – 0 – 0	S: 85 – 0 – 0	S: 90 – 0 – 0	S: 90 – 0 – 0
	5 th	S: 85 – 0 – 0	S: 85 – 0 – 0	S: 90 – 0 – 0	S: 90 – 0 – 0

Interphalangeal Distal joint Extension & Flexion	2 nd	S: 0 –0- 20	S: 0 –0- 20	S: 0 –0- 20	S: 0 –0- 20
	3 rd	S: 0 –0- 20	S: 0 –0- 20	S: 0 –0- 20	S: 0 –0- 20
	4 th	S: 0 –0- 20	S: 0 –0- 20	S: 0 –0- 20	S: 0 –0- 20
	5 th	S: 0-0-20	S: 0 – 0 - 20	S: 0 –0- 20	S: 0 –0- 20
Carpometacarpal Extension & Flexion	Thumb	S:5-0-20 Painful	S:5-0-20 Painful	S:5-0-25 Painful	S:5-0-20 Painful
Thumb Opposition		Till the tip 4th metacarpal.	Till the tip 3rd metacarpal. Painful	Till the tip 4th metacarpal. Painful	Till the tip 3rd metacarpal. Painful

Table 14 Hand ROM

HIP	ACTIVE [°]		PASSIVE [°]	
	<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion	S: 10 - 0 – 120	S: 10 - 0 - 110	S: 15 - 0 - 120	S: 15 - 0 - 125
Abduction & Adduction	F: 20 - 0 – 10	F: 20 - 0 - 10	F: 30 - 0 - 10	F: 35 - 0 - 10
External & Internal Rotation	R: 20 - 0 – 25	R: 20 - 0 - 25	R: 30 - 0 - 20	R: 30 - 0 - 20

Table 15 Hip ROM

KNEE & ANKLE	ACTIVE [°]		PASSIVE [°]	
	<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Knee Extension & Flexion	S: 0 – 0 – 110	S: 0 -0-110 Painful	S: 0 – 0 – 110	S: 0 -0-110 Painful
Ankle Dorsal & Plantar Flexion	S: 15 – 0 – 40	S: 15 – 0 - 40	S: 15–0–40 Painful	S: 20 – 0 – 50
Ankle Eversion & Inversion	R: 15 – 0 – 35	R: 20 – 0 – 35	R: 15–0-35 Painful	R: 20 – 0 - 40

Table 16 Leg ROM

METATARSAL PHALANGEAL JOINTS		ACTIVE [°]		PASSIVE [°]	
		<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion	1 st	S:70 – 0 –40	S: 75 – 0 -45	S:75-0 –50	S: 75 – 0 -50
	2 nd	S:60 – 0 - 45	S: 60 – 0 -45	S: 60 – 0 -45	S: 60 – 0- 45
	3 rd	S:65 – 0 - 40	S: 60 – 0 -40	S: 65 – 0 -45	S: 60 – 0 -40
	4 th	S:65 – 0 - 40	S: 60 – 0 -40	S: 65 – 0 -45	S: 60 – 0 -40
	5 th	S:65 – 0 - 40	S: 60 – 0 -40	S: 65 – 0 -45	S: 60 – 0 -40

Table 17 Toes ROM

CERICAL SPINE	ACTIVE [°]		PASSIVE [°]	
	Left	Right	Left	Right
Extension & Flexion	S: 35 – 0 – 35		S: 35 – 0 – 35	
Lateral Flexion	F: 20-0-20		F: 20-0-35	
Rotation	R: 40-0-40		R: 45 -0-50 Painful	

Table 18 Cervical ROM

3.3.10. Muscle Length Test (Evaluation by Janda)

- **Grade 0** – no shortness
- **Grade 1** – slight / moderate shortness
- **Grade 2** – marked shortness

LEFT		RIGHT
Grade 1	Ankle plantar flexor Two joint (dorsiflex 10°)	Grade 1
Grade 0	Ankle plantar flexor One joint (knee flexed, dorsiflex 20° and more)	Grade 0
Grade 0	Hip flexors One Joint	Grade 0
Grade 1	Hip flexors Two joints	Grade 1
Grade 1	Hip Abductor	Grade 1
Grade 1	Hamstring Muscles	Grade 1
Grade 2	Paravertebral Muscles	Grade 2
Grade 2	Muscle Pectoralis major - Lower Sternum	Grade 2
Grade 1	Muscle Pectoralis major -Middle and upper sternal part	Grade 2
Grade 0	Muscle Pectoralis major - Clavicle part and pectorals minor	Grade 0
Grade 1	Muscle Pectoralis Minor (Kendall)	Grade 1
Grade 2	Cranial part of the Trapezius muscle	Grade 2
Grade 1	Levator Scapula	Grade 2
Grade 2	Sternocleidomastoid	Grade 2
Shortened (hard barrier and limited extension)	Scalene muscles (Kendall)	Shortened (hard barrier and limited extension)

Table 19 Muscle Length Test

3.3.11. *Manual Muscle Strength Test (Evaluation by Kendall)*

- **Grade 0:** No Contraction of the muscle.
- **Grade 1:** Contraction of the muscle felt but no movement seen.
- **Grade 2:** Position in horizontal plane with gravity.
- **Grade 3:** Against gravity.
- **Grade 4:** Against gravity with moderate resistance given.
- **Grade 5:** Against gravity with maximum resistance given.

LEFT	UPPER EXTREMITY (KENDALL)	RIGHT
Grade 4	Serratus Anterior (Supine)	Grade 3
Grade 4 Painful	Upper Trapezius	Grade 3 Painful
Grade 4	Lower Trapezius	Grade 4 Painful
Grade 3	Middle Trapezius	Grade 3
Grade 3	Rhomboid (PRONE)	Grade 3
Grade 3	Lateral Rotators of Shoulder (Teres Minor & Infraspinatus)	Grade 4
Grade 4	Shoulder Medial Rotators (Latissimus Dorsi, Pectoralis Major, Subscapularis, Teres Major) SUPINE	Grade 3
Grade 4	Pectoralis Minor	Grade 4
Grade 4	Pectoralis Major Lower	Grade 4
Grade 4	Pectoralis Major Upper	Grade 4
Grade 4	Deltoid	Grade 3
Grade 4	Triceps Brachii & Anconaeus	Grade 4
Grade 4	Biceps Brachii & Brachialis	Grade 4
Grade 3	Supinator & Biceps (Biceps shortened)	Grade 3 Painful
Grade 3	Pronator Teres & Quadratus	Grade 3
Grade 3	Extensor Carpi Ulnaris	Grade 3
Grade 3 Painful	Extensor Carpi Radialis Longus & Brevis	Grade 2 Painful
Grade 3 Painful	Flexor Carpi Ulnaris	Grade 3 Painful
Grade 2 Painful	Flexor Carpi Radialis	Grade 2 Painful
Grade 3 Painful	Flexor Digitorum Profundus	Grade 2 Painful
Grade 2 Painful	Flexor Digitorum Superficialis	Grade 1 Painful

Grade 3	Extensor Indicis, Extensor Digiti Minimi & Extensor Digitorum	Grade 2 Painful
Grade 3 Painful	Palmaris Longus	Grade 2 Painful
Grade 4	Lumbricales	Grade 3
2nd finger and 5th finger Grade 2 and rest Grade 3	Palmar Interossei	Grade 3
Grade 3	Dorsal Interossei	Grade 3
Grade 3	Flexor Digiti Minimi	Grade 3
Grade 3	Opponens Digiti Minimi	Grade 3
Grade 3 Painful	Abductor Digiti Minimi	Grade 3 Painful
Grade 2 Painful	Extensor Pollicis Brevis	Grade 2 Painful
Grade 3 Painful	Extensor Pollicis Longus	Grade 3 Painful
Grade 2 Painful	Flexor Pollicis Brevis	Grade 2 Painful
Grade 3 Painful	Flexor Pollicis Longus	Grade 3 Painful
Grade 3	Opponens Pollicis	Grade 1 Painful
Grade 3 Painful	Abductor Pollicis longus	Grade 3 Painful
Grade 2 Painful	Abductor Pollicis Brevis	Grade 2 Painful
Grade 3	Adductor Pollicis	Grade 3

Table 20 Upper Extremity Strength

LEFT	TRUNK (KENDALL)	RIGHT
Grade 5	Upper Abdominal muscles (Rectus Abdominis)	Grade 5
Grade 4	Anterior Neck Flexors (Longus Capitis, Longus Colli, Rectus Capiti Anterior, Sternocleidomastoid, Anterior Scalene, Suprahyoid, Infrahyoid.)	Grade 4
Grade 3	Anterolateral Neck Flexors (Sternocleidomastoid & Scalene)	Grade 3

Table 21 Trunk Strength

LEFT	LOWER EXTREMITY (KENDALL)	RIGHT
Grade 3	Gluteus Maximus (JANDA)	Grade 3
Grade 3	Tensor Fasciae Latae	Grade 2
Grade 4	Quadriceps Femoris	Grade 4
Grade 3	Hip Flexor Iliopsoas	Grade 3
Grade 3	Hip Adductors (Pectineus, Gracilis, Adductor Longus, Adductor Magnus & Brevis)	Grade 3
Grade 3	Gluteus Medius & Minimis	Grade 3
Grade 3	Lateral Rotator of Hip Joint (Quadratus Femoris, Obturator internus & externus, Gemellus Superior & Inferior, Piriformis)	Grade 3
Grade 3	Lateral & Medial Hamstrings (Bicep Femoris & Semimembranosus, Semitendinosus)	Grade 3
Grade 3	Tricep Surae (Ankle Plantar Flexor)	Grade 3
Grade 3	Peroneus Longus & Brevis (Plantar Pronator)	Grade 3
Grade 3	Tibialis Posterior (Plantar Supinator)	Grade 3
Grade 4	Tibialis Anterior (Dorsal Supinator)	Grade 3
Grade 3	Extensor Digitorum & Extensor Hallucis Longus & Brevis	Grade 2
Grade 3	Flexor Hallucis Longus & Brevis	Grade 3
Grade 3	Flexor Digitorum Longus	Grade 3
Grade 3	Flexor Digitorum Brevis	Grade 3
Grade 2	Plantar Interossei	Grade 2
Grade 2	Dorsal Interossei	Grade 2
Grade 2	Abductor Hallucis	Grade 2

Table 22 Lower Extremity Strength

3.3.12. Muscle Tone Palpation

○: Hypo tone •: Hyper tone *: Physiological tone -: No reflex changes

REFLEX	LEFT	MUSCLES	RIGHT	REFLEX
Taut Band	•	Sternocleidomastoids	•	Taut band
-	*	Anterior Scalene	*	-
-	*	Middle Scalene	•	Taut band
Local twitch response	•	Posterior Scalene	•	Taut band
Painful	•	Upper Trapezius	•	Jump response
-	•	Levator scapulae	•	Hypertrophy
-	*	Deltoid	*	-
Trigger point	•	Supraspinatus	•	-
Trigger point	•	Infraspinatus	•	-
Trigger point	•	Rhomboid	•	Hypertrophy
-	*	Latissimus dorsi	*	-
-	•	Paravertebral muscles (Thoracic)	•	-
-	○	Biceps brachii	○	-
-	○	Triceps brachii	○	-
Taut band	•	Pectoralis major	•	-
-	•	Pectoralis minor	•	-
-	•	Diaphragm	•	More rigid
More rigid	•	Tensor Fascia Latae	•	-
-	*	Quadriceps	*	-
-	*	Gluteus maximus	*	-
-	*	Piriformis	*	-
-	•	Biceps femoris	•	-
-	•	Medial Hamstrings	•	-
-	*	Plantaris	*	-
Swollen	•	Gastrocnemius	•	Swollen
Swollen	•	Soleus	•	Swollen
-	*	Hip Adductors	*	-

Table 23 Muscle tone

3.3.13. Scar Examination

Lumbar spine Laminectomy scar at L4 till S1 is latent and the scar tissues are moveable in all direction.

3.3.14. Skin fold and Fascia Mobility Examination

Left		Right
Restricted at Lumbar and Thoracic.	Kibler Fold	Restricted at Lumbar region and mid Thoracic
Restricted	Deep Lumbar Fascia Caudally	Restricted
Slight restriction	Deep lumbar fascia Cranially	Restriction
No restriction	Dorsal fascia in transversal	Restriction
No restriction	Fascia of sides of trunk	Restriction
Restriction	Scalp Fascia	Restriction
Restriction	Cervicothoracic Junction (scapula to shoulder) Fascia	Restriction
No restriction	Upper Extremities (upper arm) Fascia	No restriction
No restriction	Upper extremities (forearm) Fascia	No restriction
Restriction	Metacarpals Fascia	Restriction
Restricted	Metatarsals Fascia	Restricted

Table 24 Skin Fascia Mobility

3.3.15. *Basic Movement Pattern Examination (Janda Approach)*

LEFT	MOVEMENT	RIGHT
<p>Quadratus lumborum + paravertebral muscles, gluteal maximus and then the hamstrings were activated on the ipsilateral side. Pelvis was slightly tilted to the right side.</p>	<p>Hip Extension</p>	<p>Quadratus lumborum was activated first followed by the hamstring activation leading the gluteal muscle activation on the ipsilateral side. Shoulder girdle muscles were not activated much.</p>
<p>Gluteus medius & minimus + tensor fascia latae, quadratus lumborum activation; rectus femoris along with the abdominal muscle was activated than iliopsoas were activated.</p>	<p>Hip Abduction</p>	<p>Gluteus medius & minimus were active along the quadratus lumborum .Abdominal muscles were not active, rectus femoris was active followed by iliopsoas.</p>
<p>Pathological sign: The flexion began with head flexed with chin tucked in activating the abdominal muscles and anterior tilting of the pelvis causing the lower extremities to lift off the bed.</p>	<p>Trunk Flexion</p>	<p>Pathological sign: The flexion began with head flexed with chin tucked in activating the abdominal muscles and anterior tilting of the pelvis causing the lower extremities to lift off the bed.</p>
<p>Pathological sign: Continuous arch of the neck flexion but limited flexions due to shortened Sternocleidomastoid muscles. But the chin protracts during the move.</p>	<p>Neck/ Head Flexion</p>	<p>Pathological sign: Continuous arch of the neck flexion but limited flexions due to shortened Sternocleidomastoid muscles. But the chin protracts during the move.</p>
<p>Supraspinatus, deltoid and trapezius cranial part was activated, with less activation of the levator scapula.</p>	<p>Shoulder Abduction</p>	<p>Supraspinatus, deltoids, trapezius and levator scapula activation, quadratus lumborum was not activated; external rotation of inferior angle of scapula.</p>

Table 25 Movement Pattern

3.3.16. Deep Stabilisation System Examination (Professor Kolář Approach)

LEFT		RIGHT
Head flexion followed by the trunk but the ribs moved laterally and the chest was positioned in inspiratory alignment.	Trunk Flexion Test	Head flexion followed by the trunk but the ribs moved laterally and the chest was positioned in inspiratory alignment.
The ribs were migrated laterally and then slightly cranial. Activation of the muscle was slightly weak against resistance.	Diaphragm test	The ribs were migrated laterally and then slightly cranial. Activation of the muscle was slightly weak against resistance.
Not Able to perform against resistance with slight activation of the lateral abdominal muscles.	Hip extension	Not Able to perform against resistance with slight activation of the lateral abdominal muscles.
The trunk shifted to the left side. Hip flexion was not performed against resistance. Lateral movements of the thigh.	Hip Flexion supine	Not able to perform hip flexion against resistance. Lateral movements of the thigh.
Intra-abdominal pressure was weak	Intra-abdominal pressure test	The diaphragm was activated first with abdominal lower area bowing out followed by abdominal muscles activation.

Table 26 Deep Stabilisation System

3.3.17. Joint Play Examination (Lewit Approach)

FEEL	LEFT	JOINTS	RIGHT	FEEL
Firm	Restricted in palmar flexion.	Wrist Radial Carpal	Restricted in Palmar Flexion.	Firm
-	Free	Wrist CMP	Restricted in Dorsal Flexion	Firm
-	Restricted caudal and cranial.	Thumb CMP	Restricted caudal & cranial.	Firm
Firm	Restricted in Radial Duction; cranial & caudal direction.	Radial Ulnar	Restricted in Radial & ulnar Duction; cranial & caudal direction.	Firm
-	Restricted	Capitate bone	Restricted	-
-	Restricted	Pisiform bone	Restricted	-
-	Restricted in cranial caudal & laterolateral direction.	PIP	Restricted in cranial caudal & laterolateral direction.	Firm
Firm	Restricted in cranial caudal & laterolateral direction.	DIP	Restricted in cranial caudal & laterolateral direction.	Firm
Firm	Restricted in cranial caudal & laterolateral direction.	MCP	Restricted in cranial caudal & laterolateral direction.	Firm
-	Free	Elbow	Free	-
Firm	Restricted in caudal & cranial direction.	Shoulder	Restricted in caudal direction	Firm
-	Restricted in cranial caudal direction.	Sterno clavicular	Restricted in cranial caudal direction.	-
Hard.	Restricted in cranial direction.	Acromio clavicular	Restricted in cranial & caudal direction.	Hard and Painful
-	Free	Scapula	Free	-
Firm	Restricted	Sacro Iliac	Restricted	Firm
-	Positive Spine sign.	Pelvis	Positive Spine sign.	-
Firm	Restricted	Talocrural	Restricted	Firm
Firm	Restricted	Subtalar & Talocalcaneo Navicular	Restricted	Firm
Firm	Restricted	Lisfranc & Chopart	Restricted	Firm
Firm	Restricted	MTP	Restricted	Firm

Table 27 Joint Play

3.3.18. Neurological Assessment

➤ **Mental State**

Consciousness and aware of the environment, place, time, date and situation and self-aware.

➤ **Higher Cerebral Function**

- Normal Cognitive skills
- Able to recall immediate, recent and remote memory.

➤ **Neck Examination**

Limited passive & active, rotation & lateral flexion bilaterally due to muscle stiffness and pain at cervical spine.

➤ **Non Cortical Sensory of Upper and Lower Extremities**

LEFT	LIGHT TOUCH	RIGHT
Normal	Shoulder C4	Normal
Normal	Forearm C6 & T 1	Normal
Normal	Thumb & Little Finger C6 & C8	Normal
Dull	Thigh L2	Dull
Dull	Calf L4 & L5	No Sensation
No Sensation	Toes	No Sensation

LEFT	PAIN	RIGHT
Normal	Shoulder C4	Normal
Normal	Forearm C6 & T 1	Normal
Sharp	Thumb & Little Finger C6 & C8	Sharp
Dull	Thigh L2	Dull
No Sensation	Calf L4 & L5	No Sensation
No Sensation	Toes	No Sensation

Table 28 Non Cortical Sensory

LEFT	DERMATOME SENSATION	RIGHT
Normal	C5	Normal
Normal	C6	Normal
Normal	C7	Normal
Normal	C8	Normal
Normal	L3	Normal
No sensation below knee.	L4	Dull sensation below knee.
No sensation below knee.	L5	Dull sensation below knee.
No Sensation	S1	No Sensation

Table 29 Dermatome

➤ **Cortical Sensory System of Upper Extremities**

LEFT		RIGHT
Present	Graphesthesia	Present
Present	Kinaesthetic sensation	Present
Present	Stereognosis	Present
Present	Two point discrimination	Present

➤ **Cortical Sensory System of Lower Extremities**

LEFT		RIGHT
Not Present	Graphesthesia	Not Present
Not Present	Kinaesthetic sensation	Not Present
Not Present	Stereognosis	Not Present
Not Present	Two point discrimination	Not Present

Table 30 Cortical Sensory

➤ **Deep Tendon Reflexology of Upper & Lower Extremities**

LEFT		RIGHT
Normal	Biceps reflex (C5-C6)	Normal
Normal	Triceps reflex (C7)	Normal
Hypo Reflexology	Flexors (C8)	Hypo Reflexology
Hypo reflexology	Patellar reflex (L 2 – 4)	Hypo reflexology
Absent	Ankle jerk (L 5 – S 2)	Absent
Absent	Medio plantar reflex (L5 –S2)	Absent

Table 31 Deep Reflexes

➤ **Special Test**

Cup grip test	Positive on the right. Patient is not able to grip with the thumb, ring and middle finger.
Pincer grip test	Positive on the right the patient is not able to pincer and hold the ball between the thumb and the ring & middle finger.
Finkelstein Test	Positive bilateral
Tinel Sign: Wrist	Positive bilateral
Phalen's Test	Negative
Froment's Sign	Positive on the right. Patient is not able adduct the thumb to hold the paper

Table 32 Special Test

➤ **Cerebellar Examination for Co-ordination**

Finger to nose	Normal but slower by the right hand
Heel – knee to shin	Normal

Table 33 Co-ordination Test

➤ **Vestibular Apparatus Examination**

Hauntant test	Normal
De kleyne test	Felt dizzy when turned to right.
Fukuda – unterberger stepping test	Positive
Walking on the line test	Positive for Vestibular (eyes closed)

Table 34 Vestibular Apparatus

3.4. Initial Examination Conclusion

KK diagnosed for seronegative rheumatoid arthritis recently, along with acute malignancy at the metacarpal phalangeal joints after the treatment of the carpal tunnel syndrome bilaterally. Therefore, the examination resulted in patient suffering from pain in small joints of the hands which she rated overall 7/10 on pan scale level. Limited ROM and joint play at the hands wrist radioulnar joint, MCP, CMP, PIP and DIP joints bilaterally affected, thus the surrounding tissues are restricted in mobility with muscle imbalance.

Localized spondylosis at C4 – C6, with hyper kyphotic position of the lower cervical spine indicated limited and painful motion of the cervical spine and shoulders. In addition, Upper body postural muscles (Sternocleidomastoid, upper trapezius fibres, levator scapula and upper extremity flexors such as pectorals, deltoids and biceps) were shortened with altered tone of the muscles mostly with trigger points.

Due to the Laminectomy done at the vertebra L4/L5 and L5/S1, whose scar was moveable and latent but the surrounding lumbar fascia mobility was restricted. This precipitated neuromuscular pathology in the lower extremities, as well as feet limited motion and joint play of the small joints as result of hammer toes and hallux valgus.

To conclude, because of the progressive diagnose and patient's growing age, she suffers from weak stabilization system, improper breathing pattern, posture, gait and balance too.

Patient demonstrated her eager and positive outlook to begin the rehabilitation therapy plan.

3.5. The goal of short - term therapeutic plan:

- Release the restricted soft/ connective tissues, fascia.
- Release trigger point & hyper toned muscle fibres.
- Improve the breathing pattern.
- Improve the joint play.
- Strengthen weak muscles (isometric conditioning)
- Stretch the shortened muscles.
- Range of motion exercises.
- Improve the sensation. (sensorimotor stimulation)
- Balance training.

3.6. The goals of long-term therapeutic plan:

- Correct the posture.
- Improve and maintain the gait.
- Prevent deformities from worsening the range of motion
- Maintain the ROM.
- Maintain the muscle strength & limit the length.
- Maintain and improve aerobic conditions.
- Maintain and improve the ADL.
- Maintain and improve the sensation.

3.7. Patient's Therapy Sessions

Session 1

Date: 16th January 2018

Duration of Therapy: 50 minutes

Subjective: Patient complained of stiff neck and back; with limited painful motion of the hands.

Objective: Swelling observed at the hand; stiff neck movement. Pain level 7/10 of the hands small joints.

Goal of today's therapy unit:

- Reduce swelling at the proximal interphalangeal joints and carpometacarpal joints.
- Relaxing and release of the deep fascia and surrounding tissues which are stiff or restricted at the lumbar and cervicothoracic region; hands and fingers to release tension or stiffness.
- Reduce restriction of limited joint play in the hands to increase the joint mobility.
- Active Tendon glide exercises of the hands for improving the range of motion.

Therapy applied:

- Soft tissue technique using the foam ball on the lumbar back; cervicothoracic junction, around the scapula and on the upper trapezius – in prone position.
- Segmental massages with fascia release technique of the Lumbar fascia in caudal and cranial direction bilaterally – 3 times with breathing on each direction, in prone position.
- Upper Trapezius PIR bilaterally – 3 times with breathing until the release was felt, in supine position.
- Lymphatic massages on bilateral hands.
- Soft tissue technique using the foam ball on bilateral hands.
- Joint play mobilization of the MCP, CMP, PIP and DIP of the hand, radial ulnar joints.

Self-therapy:

- Tendon glide exercises 5 times each on both hands.
 - Active fisting of all the fingers, followed by full extension of the all the fingers.
 - Active Flexion of all PIP & DIP, followed by full extension.
 - Active Opposition of CMP.
 - Active abduction and adduction of all the fingers.

After the session and therapy evaluation:-

Subjective: Expressed the feeling of being relaxed and comfortability which helped in developing the sense of trust towards me as therapist. She demonstrated feeling of no restriction around her neck and back, as well ease of neck motion.

Objective: It was the first meeting with the patient, so most of the time was used to perform the basic questionnaires and kinesiology examination/evaluation on the patient. The first therapy began with soft tissue techniques. It was difficult and painful for the patient to perform the tendon glide exercises when were taught as self-therapy to be performed at home. The self-therapy was taught to end the session and instructed the patient to perform it at home at least 3 times.

Session 2

Date: 17th January 2018

Duration of Therapy: 50 minutes

Subjective: Patient was very satisfied with the last therapy and felt relief around her neck and back.

Objective: Fascia was examined resulting in lumbar fascia slight restriction on the right in caudal direction along with hyper toned stiff paravertebral muscles at the lumbar spine. Swelling observed at the thumb of both hands. Pain Level 7/10 of the thumb and DIP joint especially on the right.

Goal of today's therapy unit:

- Relaxing and release the deep fascia and surrounding tissues which are stiff or restricted of the lumbar fascia; hands and fingers to release tension or stiffness.
- Relaxation of hyper toned lumbar paravertebral muscles, upper trapezius, and levator scapula, and rhomboid, Sternocleidomastoid and hand extensor / flexor muscles.
- Reduce restriction of limited joint play in the hands to increase the joint mobility.
- Sensorimotor stimulation and myofascial release of the hands to ease tension and relaxation; as well to release swelling at the thumbs.
- Active Tendon glide exercises of the hands for improving the range of motion.
- Correcting the breathing pattern from the abdomen to the upper chest breathing wave, and correct activation of the diaphragm along with ribs for inspiration and expiration pattern.

Therapy applied:

- Soft tissue technique / segmental massages at Lumbar region.
- Lumbar fascia release technique in caudal direction on the right – 4 times with breathing until the release was felt, in prone position.
 - PIR technique to relax the hyper toned lumbar paravertebral muscles, upper trapezius, levator scapula and rhomboid muscles bilaterally – 3 times with breathing until the release was felt.
- Lymphatic massage of the hand bilaterally.
- Soft tissue techniques using the foam ball of the hands bilaterally.
- Joint play mobilization of the MCP, CMP, PIP and DIP of the hand, radial ulnar joints.
- Sensorimotor stimulation of hands using the spiky ball in circular motion on the palm of the hands and fingers bilaterally.
- Tendon glide exercises 5 times each.
 - Active fisting of all the fingers, followed by full extension of the all the fingers.
 - Active Flexion of all PIP & DIP, followed by full extension.

- Active Opposition of CMP.
- Active abduction and adduction of all the fingers.
- Breathing exercises –with intervals in supine and sitting position, each exercises 4 repetition.
 - Giving pressure on the lower ribs and asking the patient to breath in and out in that part; Asking the patient to give pressure by own self on the abdomen and chest and clavicular part and induce it with inhalation and exhalation.
- Modification of breathing exercise
 - Using wooden stick held by both hands and raising arm while inhalation and bring it down during exhalation in supine position.
 - Sitting position using the wooden stick held by both arms and keep the upper body and back straight rotate to left, breath in and back to middle starting position and breath out; vice versa on the right.
 - Using Thera band wrapped around both hands with each end of the band, keep the elbow flexed at 90 ° and close to the body, with resistance from the band move both elbows simultaneously laterally outwards while breathing in and then relaxing by breathing out in to starting position.

Self-therapy

- Tendon glide exercises 5 times each on both hands.
 - Active fisting of all the fingers, followed by full extension of the all the fingers.
 - Active Flexion of all PIP & DIP, followed by full extension.
 - Active Opposition of CMP.
 - Active abduction and adduction of all the fingers.
- Self PIR for the Extensors and Flexors of the hand with breathing, 3 repetitions on each side.
- Self PIR of Sternocleidomastoid.

After the session and therapy evaluation:-

Subjective: Patient showed her willingness and motivating thrive to participate in the therapy. She felt pain in the CMP (thumb region) when the soft tissue massage and joint mobilization was performed.

Objective: Mobilization of the MCP joints was less restricted comparable from the last therapy especially on the left hand. Limited right hand active flexion of the index and third finger DIP joints. Pain level reduced to 5/10 at the thumb and DIP joint. Difficulty was observed at the felt fatigue after the breathing exercises. The self-therapy was taught to end the session and instructed the patient to perform it at home at least 3 times.

Session 3

Date: 18th January 2018

Duration of Therapy: 50 minutes

Subjective: Patient expressed that pain in her hands especially at the thumbs is better; she has been working on the self-therapy and her grip. She complained of pain around her neck and difficulty is rotating the head to each side.

Objective: Hyper toned stiff paravertebral muscles at the lumbar spine, levator scapula and upper trapezius. Pain Level of the hands 5/10. Increased right hand active flexion of the index and third finger DIP joints.

Goal of today's therapy unit:

- Relaxing and release the deep fascia and surrounding tissues which are stiff or restricted around the neck (Neck extensors - The splenius capitis and the splenius cervicis); hands and fingers and feet to release tension or stiffness.
- Relaxation of hyper toned lumbar paravertebral muscles, upper trapezius, levator scapula and hand extensor / flexor muscles.
- Improving the mobility of the neck.
- Reduce restriction of limited joint play in the hands and feet to increase the joint mobility.
- Sensorimotor stimulation and myofascial release of the hands and feet to ease tension and relaxation.

- Improving the range of motion of the hands.
- Strengthening the muscles of hands especially to improve the grip.
- Correcting the breathing pattern from the abdomen to the upper chest breathing wave, and correct activation of the diaphragm along with ribs for inspiration and expiration pattern.

Therapy applied:

- Soft tissue technique / segmental massages around the neck and shoulders. –in supine position.
- PIR technique to relax the hyper toned lumbar paravertebral muscles and upper trapezius, levator scapulae bilaterally – 3 times with breathing until the release was felt.
- Deep fascia stretch of the neck extensors – with breathing in supine position.
- Slight cervical spine traction: pushing on the shoulder with one hand and with other hand baby holding the head and slight traction / pull given with lateral flexion bilaterally ; with each breath out the pull was increased – 3 times until release was felt with breathing in supine position.
- Active neck flexion with proper stereotype (chin tucked in); active neck rotation.
- Neck extensor exercises with eye movement: moving the eyes up (looking towards forehead), moving the eyes down (looking towards the chin), moving the eyes in circumduction, moving the eyes as drawing the infinity / eight sign. –2 repetitions of each.
- Lymphatic massage of the hand and feet bilaterally.
- Soft tissue techniques using the foam ball of the hands and feet bilaterally.
- Joint play mobilization of the MCP, CMP, PIP and DIP of the hand, radial ulnar joints bilaterally.
- Joint play mobilization of the TSM and transverse tarsal joints, tarsal bones (navicular and cuboid), MTP, toe PIP and DIP bilaterally.
- Sensorimotor stimulation and myofascial release of hands using the spiky ball in circular motion on the palm of the hands and fingers; feet bilaterally.

- Tendon glide exercises 5 times each.
 - Active fisting of all the fingers, followed by full extension of the all the fingers.
 - Active Flexion of all PIP & DIP, followed by full extension.
 - Active Opposition of CMP.
 - Active abduction and adduction of all the fingers.
- Hand strengthening exercises :- 5 times each, bilaterally
 - Gripping on to the hand ball and focusing on holding the grip by the PIP and DIP.
 - Pinch Strengthen – pinch on to the soft foam ball between the each finger and the thumb; hold for 10 seconds and release.
 - Finger stretch – place the palm down on the table; gently straighten the fingers and flatten against the surface without forcing on the joint; hold for 20 seconds and release.
 - Thumb extension – hand flatten on the table with wrapped Thera band around the MCP joints; gently moving thumb away (abducting) against the resistance of the band and hold for 10 seconds and release.
- Breathing exercises –with intervals in supine and sitting position, each exercises 4 repetition.
 - Giving pressure on the lower ribs and asking the patient to breath in and out in that part; Asking the patient to give pressure by own self on the abdomen and chest and clavicular part and induce it with inhalation and exhalation.
- Modification of breathing exercise
 - Using wooden stick held by both hands and raising arm while inhalation and bring it down during exhalation in supine position.
 - Sitting position using the wooden stick held by both arms and keep the upper body and back straight rotate to left, breath in and back to middle starting position and breath out; vice versa on the right.
 - Using Thera band wrapped around both hands with each end of the band, keep the elbow flexed at 90 ° and close to the body, with resistance from the band

move both elbows simultaneously laterally outwards while breathing in and then relaxing by breathing out in to starting position.

Self-therapy:

- Tendon glide exercises 5 times each on both hands.
 - Active fisting of all the fingers, followed by full extension of the all the fingers.
 - Active Flexion of all PIP & DIP, followed by full extension.
 - Active Opposition of CMP.
 - Active abduction and adduction of all the fingers.
- Hand strengthening exercises :- 5 times each, bilaterally
 - Gripping on to the hand ball and focusing on holding the grip by the PIP and DIP.
 - Pinch Strengthen – pinch on to the soft foam ball between the each finger and the thumb; hold for 10 seconds and release.
 - Finger stretch – place the palm down on the table; gently straighten the fingers and flatten against the surface without forcing on the joint; hold for 20 seconds and release.
 - Thumb extension – hand flatten on the table with wrapped Thera band around the MCP joints; gently moving thumb away (abducting) against the resistance of the band and hold for 10 seconds and release.
- Self PIR for the Extensors and Flexors of the hand with breathing, 3 repetitions on each side.
- Self PIR of the Sternocleidomastoid and Upper Trapezius.
- Self-Stimulation of the feet sensorimotor proprioception by using a stroking brush or spiky ball.
- Focusing on the balancing the feet on the “three points” of the foot and working on increasing the foot arch by making hallow with foot.

After the session and therapy evaluation:-

Subjective: The patient felt dizzy while performing the neck extensors exercises with eye movement. Patient elaborated that this is the first time in 3 years she felt a muscles pull/stretch on her left foot plantar.

Objective: The cervical traction was performed under the supervision of the supervisor and under her instructions. Neck extensor exercise was continued only till she expressed the discomfort, which was two repetitions only. The self-therapy was taught to end the session and instructed the patient to perform it at home at least 3 times.

Session 4

Date: 19th January 2018

Duration of Therapy: 45 minutes

Subjective: Patient felt fine and enthusiastic to work with her foot. She elaborated that she felt the muscle pull on her foot yesterday whenever she walked.

Objective: Pain Level of the hand fingers 6/10. Slight swelling observed at the MCP joints bilaterally and thenar eminence of the right hand, thus limited motion of the thumb observed. ROM evaluation of the upper extremity, pain causes limited movement at the shoulder around 120 ° shoulder flexion bilaterally but more on the right.

Goal of today's therapy unit:

- Relaxing and release the deep fascia and surrounding tissues which are stiff or restricted around the hands and fingers and feet to release tension or stiffness.
- Relaxation of hyper toned lumbar paravertebral muscles, upper trapezius, levator scapula and hand extensor/ flexor muscles.
- Reduce restriction of limited joint play in the hands and feet to increase the joint mobility.
- Sensorimotor stimulation and myofascial release of the hands and feet to ease tension and relaxation.
- Improving the range of motion of the hands.

- Strengthening the muscles of hands especially to improve the grip.
- Facilitation technique for shoulders and scapula to evoke motor responses and improve neuromuscular control and functional movement by increasing the range of motion and its strength.
- Correcting the breathing pattern from the abdomen to the upper chest breathing wave, and correct activation of the diaphragm along with ribs for inspiration and expiration pattern.
- Posture correction education.
- Balance training for vestibular training and to prevent any falls and improve stability.

Therapy applied:

- PIR technique to relax the hyper toned lumbar paravertebral muscles and upper trapezius, levator scapulae bilaterally – 3 times with breathing until the release was felt.
- Lymphatic massage of the hand and feet bilaterally.
- Soft tissue techniques using the foam ball of the hands and feet bilaterally.
- Joint play mobilization of the MCP, CMP, PIP and DIP of the hand, radial ulnar joints bilaterally.
- Joint play mobilization of the TSM and transverse tarsal joints, tarsal bones (navicular and cuboid), MTP, toe PIP and DIP bilaterally.
- Sensorimotor stimulation and myofascial release of hands using the spiky ball in circular motion on the palm of the hands and fingers; feet bilaterally.
- Tendon glide exercises 5 times each.
 - Active fisting of all the fingers, followed by full extension of the all the fingers.
 - Active Flexion of all PIP & DIP, followed by full extension.
 - Active Opposition of CMP.
 - Active abduction and adduction of all the fingers.
- Hand strengthening exercises :- 5 times each, bilaterally
 - Gripping on to the hand ball and focusing on holding the grip by the PIP and DIP.

- Pinch Strengthen – pinch on to the soft foam ball between the each finger and the thumb; hold for 10 seconds and release.
- Finger stretch – place the palm down on the table; gently straighten the fingers and flatten against the surface without forcing on the joint; hold for 20 seconds and release.
- Thumb extension – hand flatten on the table with wrapped Thera band around the MCP joints; gently moving thumb away (abducting) against the resistance of the band and hold for 10 seconds and release.
- PNF for the shoulders and scapula: 1st & 2nd diagonal, flexion and extension pattern. Relaxation technique Contract-Relax to increase range of motion. Followed with a facilitator technique Dynamic Reversals to increase the strength of the newly gained ROM.
- Breathing exercises –with intervals in supine and sitting position, each exercises 4 repetition.
 - Giving pressure on the lower ribs and asking the patient to breath in and out in that part; Asking the patient to give pressure by own self on the abdomen and chest and clavicular part and induce it with inhalation and exhalation.
 - Modification of breathing exercise
 - Using wooden stick held by both hands and raising arm while inhalation and bring it down during exhalation in supine position.
 - Sitting position using the wooden stick held by both arms and keep the upper body and back straight rotate to left, breath in and back to middle starting position and breath out; vice versa on the right.
 - Using Thera band wrapped around both hands with each end of the band, keep the elbow flexed at 90 ° and close to the body, with resistance from the band move both elbows simultaneously laterally outwards while breathing in and then relaxing by breathing out in to starting position.
- Posture correction education for self-therapy.
- Balance training using the balance soft pad –performed bare feet (without socks and shoes on)

- Standing on the balance pad with feet apart, feet together and with eyes open and closed.
- Single leg stance: one leg on the balance pad and another off the pad on the ground, focusing on the three points on the foot on the pad.
- Toe stance: MTP placed on the edge of the pad and heel on the ground, alternatively lifting off one heel and balancing the stance of the toes.
- Eversion / Inversion: of the foot while focusing on performing the movement in the feet and stabilization the knee to prevent motion coming from the knee – Sitting position.

Self-therapy:

- Tendon glide exercises 5 times each on both hands.
 - Active fisting of all the fingers, followed by full extension of the all the fingers.
 - Active Flexion of all PIP & DIP, followed by full extension.
 - Active Opposition of CMP.
 - Active abduction and adduction of all the fingers.
- Hand strengthening exercises :- 5 times each, bilaterally
 - Gripping on to the hand ball and focusing on holding the grip by the PIP and DIP.
 - Pinch Strengthen – pinch on to the ball between the each finger and the thumb; hold for 10 seconds and release.
 - Finger stretch – place the palm down on the table; gently straighten the fingers and flatten against the surface without forcing on the joint; hold for 20 seconds and release.
 - Thumb extension – hand flatten on the table with wrapped Thera band around the MCP joints; gently moving thumb away (abducting) against the resistance of the band and hold for 10 seconds and release.
- Self PIR for the Extensors and Flexors of the hand with breathing, 3 repetitions on each side.
- Self PIR of the Sternocleidomastoid and Upper Trapezius.

- Self-Stimulation of the feet sensorimotor proprioception by using a stroking brush or spiky ball.
- Focusing on the balancing the feet on the “three points” of the foot and working on increasing the foot arch by making hollow with foot.
- Posture correction – the patient was advised to stand in front of the mirror; first of all she was asked to tell what she saw asymmetrical about her posture and try correcting it. Then she was taught to tuck her chin in such a way to keep her head straight and aligned with the spine (from lateral view); suppress her shoulders and try levelling them. Correcting her ante version pelvis to neutral position and focussing on the “three points” of the feet.

After the session and therapy evaluation:-

Subjective: Patient was exhausted at the end of the therapy; especially after the balance training. But overall she was satisfied with the therapy. Focused on correcting her posture whenever she realises.

Objective: PNF of the shoulders was terminated because it provoked discomfort and pain to the patient but the Scapula PNF therapy was continued with no discomfort. Intensity of the strength exercises was increased using a rubber material ball rather than the soft foam ball. The self-therapy was taught to end the session and instructed the patient to perform it at home at least 3 times.

Session 5

Date: 22nd January 2018

Duration of Therapy: 45 minutes

Subjective: Patient said that she has been working on the exercises for the hands taught to her during the weekend. As well she focused on correcting her posture. She expressed happily about her improvement with her grip and finer motions.

Objective: Overall ROM evaluation of the upper extremities, resulted in impressive improvement of the fingers motion especially at the right hand active flexion of the index and third finger DIP joints. Grip test using a cup demonstrated improving grip of the hand with improved flexion and opposition of the thumb especially of the left. Shoulder ROM flexion around 120 ° is still painful.

Goal of today's therapy unit:

- Relaxing and release the deep fascia and surrounding tissues which are stiff or restricted around the hands and fingers and feet to release tension or stiffness.
- Relaxation of hyper toned lumbar paravertebral muscles, upper trapezius, levator scapula and hand extensor/ flexor muscles.
- Plantar aponeurosis relaxation technique to improve the activity of the foot arch.
- Reduce restriction of limited joint play in the hands and feet to increase the joint mobility.
- Sensorimotor stimulation and myofascial release of the hands and feet to ease tension and relaxation.
- Improving the range of motion of the hands.
- Strengthening the muscles of hands especially to improve the grip.
- Correcting the breathing pattern from the abdomen to the upper chest breathing wave, and correct activation of the diaphragm along with ribs for inspiration and expiration pattern.
- Posture correction education.
- Balance training for vestibular training and to prevent any falls and improve stability.
- Gait Training

Therapy applied:

- PIR technique to relax the hyper toned lumbar paravertebral muscles and upper trapezius, levator scapulae bilaterally – 3 times with breathing until the release was felt.
- Lymphatic massage of the hand and feet bilaterally.
- Soft tissue techniques using the foam ball of the hands and feet bilaterally.
- Joint play mobilization of the MCP, CMP, PIP and DIP of the hand, radial ulnar joints bilaterally. – 10 minutes.
- Joint play mobilization of the TSM and transverse tarsal joints, tarsal bones (navicular and cuboid), MTP, toe PIP and DIP bilaterally.
- Sensorimotor stimulation and myofascial of hands using the spiky ball in circular motion on the palm of the hands and fingers; feet bilaterally.

- Tendon glide exercises 5 times each.
 - Active fisting of all the fingers, followed by full extension of the all the fingers.
 - Active Flexion of all PIP & DIP, followed by full extension.
 - Active Opposition of CMP.
 - Active abduction and adduction of all the fingers.
- Hand strengthening exercises :- 5 times each, bilaterally
 - Gripping on to the hand ball and focusing on holding the grip by the PIP and DIP.
 - Pinch Strengthen – pinch on to the soft foam ball between the each finger and the thumb; hold for 10 seconds and release.
 - Finger stretch – place the palm down on the table; gently straighten the fingers and flatten against the surface without forcing on the joint; hold for 20 seconds and release.
 - Thumb extension – hand flatten on the table with wrapped Thera band around the MCP joints; gently moving thumb away (abducting) against the resistance of the band and hold for 10 seconds and release.
- PIR of the Quadrates plantae bilaterally – 3 repetitions until release and improve movement felt in prone position.
- Breathing exercises – with intervals in supine and sitting position, each exercises 4 repetition.
 - Giving pressure on the lower ribs and asking the patient to breath in and out in that part; Asking the patient to give pressure by own self on the abdomen and chest and clavicular part and induce it with inhalation and exhalation.
- Modification of breathing exercise
 - Using wooden stick held by both hands and raising arm while inhalation and bring it down during exhalation in supine position.
 - Sitting position using the wooden stick held by both arms and keep the upper body and back straight rotate to left, breath in and back to middle starting position and breath out; vice versa on the right.

- Using Thera band wrapped around both hands with each end of the band, keep the elbow flexed at 90 ° and close to the body, with resistance from the band move both elbows simultaneously laterally outwards while breathing in and then relaxing by breathing out in to starting position.
- Posture correction education for self-therapy.
- Balance training using the balance soft pad – performed bare feet (without socks and shoes on)
 - Standing on the balance pad with feet apart, feet together and with eyes open and closed.
 - Single leg stance: one leg on the balance pad and another off the pad on the ground, focusing on the three points on the foot on the pad.
 - Toe stance: MTP placed on the edge of the pad and heel on the ground, alternatively lifting off one heel and balancing the stance of the toes.
 - Eversion / Inversion: of the foot while focusing on performing the movement in the feet and stabilization the knee to prevent motion coming from the knee – Sitting position.
 - Using BOSU ball next to the supporting wall ladder for the patient to hold on to train balancing and standing on it with straight posture; semi squatting with support; waddling body weight on each leg alternatively.
- Gait training
 - Walking in front of the mirror with corrective posture.
 - Walking with corrective stride length symmetrically bilateral.
 - Walking forward with appropriate hip and knee flexion.
 - Walking forward on the straight line.
 - Walking backwards with training of appropriate hip extension

Self-therapy:

- Tendon glide exercises 5 times each on both hands.
 - Active fisting of all the fingers, followed by full extension of the all the fingers.
 - Active Flexion of all PIP & DIP, followed by full extension.

- Active Opposition of CMP.
- Active abduction and adduction of all the fingers.
- Hand strengthening exercises :- 5 times each, bilaterally
 - Gripping on to the hand ball and focusing on holding the grip by the PIP and DIP.
 - Pinch Strengthen – pinch on to the ball between the each finger and the thumb; hold for 10 seconds and release.
 - Finger stretch – place the palm down on the table; gently straighten the fingers and flatten against the surface without forcing on the joint; hold for 20 seconds and release.
 - Thumb extension – hand flatten on the table with wrapped Thera band around the MCP joints; gently moving thumb away (abducting) against the resistance of the band and hold for 10 seconds and release.
- Self PIR for the Extensors and Flexors of the hand with breathing, 3 repetitions on each side.
- Self PIR of the Sternocleidomastoid and Upper Trapezius.
- Self PIR of the Quadrates Plantae in sitting position.
- Self-Stimulation of the feet sensorimotor proprioception by using a stroking brush or spiky ball.
- Focusing on the balancing the feet on the “three points” of the foot and working on increasing the foot arch by making hallow with foot.
- Posture correction.

After the session and therapy evaluation:-

Subjective: Patient was satisfied and happy with her improvement too. She felt exhausted and muscle fatigue on her lower limbs at the end of balance and gait training.

Objective: Imposing improvement observed at the ROM and grip strength of the hands. The self-therapy was taught to end the session and instructed the patient to perform it at home at least 3 times. As well focus on correcting her posture whenever she realises.

Session 6

Date: 23rd January 2018

Therapy session had to be cancelled since the patient had to leave the hospital for other medical evaluations.

Session 7

Date: 25th January 2018

Duration of Therapy: 1 hour and 20 minutes

Subjective: She felt a bit less energetic. Expressed willingness to continue with the therapy.

Objective: Improved ROM and grip of the hands; improved sensation of the lower limbs more on the left and feels the muscles activity on the foot.

Goal of today's therapy unit:

- Relaxing and release the deep fascia and surrounding tissues which are stiff or restricted around the hands and fingers and feet to release tension or stiffness.
- Relaxation of hyper toned lumbar paravertebral muscles, upper trapezius, levator scapula and hand extensor/ flexor muscles.
- Plantar aponeurosis relaxation technique to improve the activity of the foot arch.
- Reduce restriction of limited joint play in the hands and feet to increase the joint mobility.
- Sensorimotor stimulation and myofascial release of the hands and feet to ease tension and relaxation.
- Improving the range of motion of the hands.
- Strengthening the muscles of hands especially to improve the grip.
- Correcting the breathing pattern from the abdomen to the upper chest breathing wave, and correct activation of the diaphragm along with ribs for inspiration and expiration pattern.
- Posture correction education.

- Balance training for vestibular training and to prevent any falls and improve stability.
- Gait Training

Therapy applied:

- Lymphatic massage of the hand and feet bilaterally.
- Soft tissue techniques using the foam ball of the hands and feet bilaterally.
- Joint play mobilization of the MCP, CMP, PIP and DIP of the hand, radial ulnar joints bilaterally.
 - Joint play mobilization of the TSM and transverse tarsal joints, tarsal bones (navicular and cuboid), MTP, toe PIP and DIP bilaterally.
 - Sensorimotor stimulation and myofascial release of hands using the spiky ball in circular motion on the palm of the hands and fingers; feet bilaterally.
 - Balance training using the balance soft pad - performed bare feet (without socks and shoes on)
 - Standing on the balance pad with feet apart, feet together and with eyes open and closed.
 - Single leg stance: one leg on the balance pad and another off the pad on the ground, focusing on the three points on the foot on the pad.
 - Toe stance: MTP placed on the edge of the pad and heel on the ground, alternatively lifting off one heel and balancing the stance of the toes.
 - Eversion / Inversion: of the foot while focusing on performing the movement in the feet and stabilization the knee to prevent motion coming from the knee – Sitting position.
 - Using BOSU ball next to the supporting wall ladder for the patient to hold on to train balancing and standing on it with straight posture; semi squatting with support; waddling body weight on each leg alternatively.
- Gait training
 - Walking in front of the mirror with corrective posture.
 - Walking with corrective stride length symmetrically bilateral.
 - Walking forward with appropriate hip and knee flexion.
 - Walking forward on the straight line.

- Walking backwards with training of appropriate hip extension.
- Training walk without the walking aid.

Self-therapy:

- Tendon glide exercises 5 times each on both hands.
 - Active fistng of all the fingers, followed by full extension of the all the fingers.
 - Active Flexion of all PIP & DIP, followed by full extension.
 - Active Opposition of CMP.
 - Active abduction and adduction of all the fingers.
- Hand strengthening exercises :- 5 times each, bilaterally
 - Gripping on to the hand ball and focusing on holding the grip by the PIP and DIP.
 - Pinch Strengthen – pinch on to the ball between the each finger and the thumb; hold for 10 seconds and release.
 - Finger stretch – place the palm down on the table; gently straighten the fingers and flatten against the surface without forcing on the joint; hold for 20 seconds and release.
 - Thumb extension – hand flatten on the table with wrapped Thera band around the MCP joints; gently moving thumb away (abducting) against the resistance of the band and hold for 10 seconds and release.
- Self PIR technique to relax the hyper toned lumbar paravertebral muscles and upper trapezius, Sternocleidomastoid, levator scapulae bilaterally – 3 times with breathing until the release is felt.
- Self PIR for the Extensors and Flexors of the hand with breathing, 3 repetitions on each side.
- Self PIR of the Quadrates Plantae in sitting position.
- Self-Stimulation of the feet sensorimotor proprioception by using a stroking brush or spiky ball.
- Focusing on the balancing the feet on the “three points” of the foot and working on increasing the foot arch by making hallow with foot.

- Posture correction.
- Gait improving strategies.

After the session and therapy evaluation:-

Subjective: Patient was satisfied with the therapy and over all impressed at her improvement. She expressed a promising potential to continue to with self-therapy in order to maintain her improvements especially with her grip and sensation of the lower limbs.

Objective: About 45 minutes of the session was used for the final kinesiology examination since it was patient's last day at the hospital. She was unaware of the equipment's that Ergo therapist could provide her with her Daily living, so she was advised to see one.

3.8. Final Kinesiology Examination.

3.8.1. Observations

- Overall the body is shifted to the right.
- Patient correcting her posture when standing with shoulder levelling symmetrically and pulling her pelvis from ante version to neutral position.
- Deformity still observed at the metacarpal joints bilaterally, but reduced swelling at the first interphalangeal and carpometacarpal joints.
- Improve positioning of the right index finger.
- Improved grip flexion and strength of bilateral hands.
- Hallux valgus bilaterally.
- Improved straightening / extension of the hammer toes of the right toes and the activity too.

3.8.2. Postural Examination (Static)

POSTERIOR VIEW		
The base support	Wide base of support, the distance between the heels in less than the length of the foot, the weight is normally distributed.	
Shape and contours of the heels	Symmetrically rounded heels	
Shape and position of the ankle joints	The left medial malleolus contour is prominent than left.	
Contour of the calf muscle	Left calf muscles are wider than the right.	
Knee Joints	Valgus	
Popliteal line	Right is wider in length and laterally the higher than left. Both are medially downwards.	
Contour of the thigh muscles	The left is wider than the right.	
Sub gluteal line	Right is wider and visible.	
Gluteal muscles	Atrophy of gluteal muscles, more of the left.	
Position of the Posterior Superior Iliac crest	The right is about 2cm higher than the left (<i>on Palpation</i>)	
Symmetry of thoracobrachial triangles	Present only on the left.	
Curvature of the spine in frontal plane	Cervical Vertebrae	Normal lordosis of the upper cervical, hyper kyphosis from C4 till C6.
	Thoracic Vertebrae	Hyper kyphosis of the from TH1 to TH3, convexity from TH 8 to TH 12
	Lumbar Vertebrae	Scoliosis towards left at L1 to L3, normal lordosis curve at L4 – L5.
Position of the scapula	Right scapula is abducting outwards and the inferior angle is prominent	
Position of the shoulder girdle	Right shoulder is lower than left.	
Upper limb	Symmetrical same length.	
Position of the head	Towards the left.	
Trunk	Upper body is shifted to the left.	

Table 35 Final Posterior View

LATERAL VIEW	
Contour of the thigh muscles	Left is Posteriorly wider & prominent.
Contour of the calf muscle	Left muscles below the knee is prominent posteriorly.
Position of the knee joints	Both knees are extended with left more than the right.
Position of the pelvis	Ante version
Position and curvature of the Spine	Hyper Kyphosis from C4 till TH2
Shape of the abdominal muscles	Protruding belly outwards and forward down.
Position of the elbow	Both elbows are flexed with the right more.
Position of the shoulder girdle	Protracted shoulders
Position of the head	Protracted head.
Position of the trunk	Protracted / ante flexed
Hand / fingers	The fingers are semi flexed, the index finger of the right is in abducted position.

Table 36 Final Lateral View

ANTERIOR VIEW	
Foot arches	Symmetrically normal
The position and shape of the toes	Hammer toes observed on both. Hallux valgus of both big toes.
Position of the foot	The foot is externally rotated (hip External rotation)
Contour of the calf muscles	Right is wider than left.
Shape and position of the knee joints / Patella	Left knee is lower than right; both knees are demonstrating valgus.
Shape of the thigh muscles	Right is wider than the left.
Anterior superior iliac spine	Right is slightly higher.
Symmetry of the thoracobrahcial triangles	Left below the elbow is visible only.
Position of the shoulder girdle	Right shoulder is lower.
Upper limbs	Right arm is lower/longer than left.
Position of the head	The head is tilted to right.

Table 37 Final Anterior View

3.8.3. Pelvis Palpation

Height and symmetry of Iliac Crest	Right iliac crest is about 2 cm higher than left.
Posterior Superior Iliac Spine (SIPS)	Right is slightly higher
Anterior Superior Iliac Spine (SIAS)	Right is slightly higher
Pelvic rotation/ torsion/ twisted	Slight tilt of the pelvis
Ante version (anterior tilt) or Retroversion (posterior tilt)	Ante version

Table 38 Final Pelvis Examination

3.8.4. Assessment of Breathing Stereotype pattern

The patient is observed using the abdominal part for breathing along with activation of the lower ribs; the upper chest (clavicular) part is still a bit used less; it's the same in supine and standing position. In sitting position uses more of the abdominal part for breathing.

3.8.5. Specific Testing

- **Romberg test**
 - **Test 1** Normal
 - **Test 2** Loses balance
 - **Test 3** Loses balance
 - **Veale Test**
- The test is positive, loses balance after 5 seconds after standing with feet together, but immediately with eyes closed.

Grade 3 on the right and Grade 4 on the left.

3.8.6. Anthropometric Measurement

Circumference of the thorax during Inhalation and Exhalation (sum up)	
Upper chest (around the axilla)	2.5 cm
Mid sternum	3 cm
Height of xyphoid process	1.5 cm

Table 39 Final Chest Circumference

LEFT		RIGHT
77 cm	Length of the whole upper extremity (measured from the acromion to the tip of third finger)	76 cm
97cm	Anatomical length (supine position, from major trochanter to lateral malleolus)	96cm
107 cm	Functional length (umbilicus to the medial malleolus)	105 cm
99 cm	Functional length (from the anterior superior iliac spine to the medial malleolus)	99 cm
59 cm	Circumference of the thigh (testing the quadriceps muscle, is measured 15cm above the knee cap)	60 cm

Table 40 Final Anthropometric

3.8.7 Spinal Distances

Thomayer's Distance	1 cm	
Shober's Distance	6 cm	
Stibor's Distance	8 cm	
Lateral Flexion	Left – 20 cm	Right – 21 cm
Cepojev Distance	4 cm	

Table 41 Final Spine Distance

3.8.8 Gait Analysis

GAIT	
Width of the base of support.	Wider base
Walking Rhythm	Ideal
Walking speed	Slow pace
Stride length	Symmetrical steps on both legs.
Movement of the foot.	<ul style="list-style-type: none"> • Heel strike – Ideal • Flat foot – the entire foot touches the ground. • Loading response - ideal • Heel off - Ideal • Toe off – Ideal.
Position and Movement of the knee and hip	Ideal flexion of the knee & hip joint; limited hip extension more on the right.
Position and movement of the pelvis.	Ideal sway of pelvis laterally lateral.
Position and movement of the trunk.	Trunk ante flexion and rotating towards the left.
Position and movement of the upper extremity.	Shoulder movement is not very pronounced on the right, but normal arm sway on the left. Bilateral elbows are semi flexed.
Position of the head.	Head is protracted and downwards.
Stability of walking.	Patient walks with body leaning more towards the left.

Table 42 Final Gait

MODIFICATION OF GAIT ANALYSIS	
Walk on the narrow base.	Patient loses balance after 5 steps.
Walk on soft surface.	Patient walks normally.
Walk with eyes closed.	Patient loses balance after 2 steps.
Walk backwards.	Patient deviates towards the left side, with limited hip extension on left.
Walk up steps.	Walks ideally.

Table 43 Final Modified Gait

3.8.9 ROM Goniometer Measurements & End Feel. (Janda Approach & SFTR format)

SHOULDER	ACTIVE [°]		PASSIVE [°]	
	<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion	S : 30 – 0 - 100 Painful Flexion	S : 30 – 0 - 120 Painful Flexion	S : 30 – 0 - 110 Painful Flexion	S : 30 – 0 - 110 Painful Flexion
Abduction	F : 90 Painful	F : 70 Painful	F : 100 Firm	F : 90 Painful
Horizontal Abduction & Adduction	T : 30 – 0 - 110	T : 30 – 0 - 110	T : 30 – 0 - 110	T : 30 – 0 - 110
External & Internal Rotation	R : 30–0-75 Painful External	R : 30–0-70 Painful External	R : 40–0-90 Firm	R : 40–0-90 Firm

Table 44 Final Shoulder ROM

ELBOW	ACTIVE [°]		PASSIVE [°]	
	<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion	S : 0 – 0 – 140	S : 0 – 0 - 140	S : 0 – 0 - 140	S : 0 – 0 - 140
Supination & Pronation	R : 90 – 0 – 80	R : 90 – 0 - 80	R : 90 – 0 - 85	R : 90 – 0 - 90

Table 45 Final Elbow ROM

WRIST & FINGERS		ACTIVE [°]		PASSIVE [°]	
		<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion		S :45-0-80	S :35-0-75	S :65-0-80	S: 60-0-75
Radial & Ulnar Duction		F :10-0-12	F:10-0-10	F :10-0-12	F :10-0-10
Metacarpophalangeal Joints Extension & Flexion	1 st	S: 0 - 0 - 30	S: 0 - 0 - 20 Painful Flexion	S: 0 - 0 - 30	S: 0 - 0 - 20 Painful Flexion
	2 nd	S: 10 0-90	S: 10-0-85	S: 10-0-90	S: 10-0-85
	3 rd	S: 10 0-90	S: 10-0-85	S: 10-0-90	S: 10-0-85
	4 th	S: 10-0-90	S: 10-0-85	S: 10-0-90	S: 10-0-85
	5 th	S: 10-0-90	S: 10-0-85	S: 10-0-90	S: 10-0-85
Thumb (1st) Carpometacarpal & Metacarpophalangeal Joints Abduction & Adduction	1 st	F: 30-0-35	F: 20-0-25	F: 30-0-35	F: 20-0-25
	2 nd	F: 20-0-15	F: 20-0-15	F: 20-0-15	F: 2-0-15
	3 rd	F: 20-0-15	F: 20-0-15	F: 20-0-15	F: 20-0-15
	4 th	F: 20-0-15	F: 20-0-15	F: 20-0-15	F: 20-0-15
	5 th	F: 20-0-15	F: 20-0-15	F: 2-0-15	F: 20-0-15
Interphalangeal Proximal joint Extension & Flexion	1 st	S: 0 - 0-40	S: 0-0-40	S: 0-0-40	S: 0-0-40
	2 nd	S: 85-0 - 0	S: 85 -0- 0	S: 90 -0- 0	S: 90 -0- 0
	3 rd	S: 85-0-0	S: 85 -0- 0	S: 90 -0- 0	S: 90 -0- 0
	4 th	S: 85 -0- 0	S: 85 -0- 0	S: 90 -0- 0	S: 90 -0- 0
	5 th	S: 85 -0- 0	S: 85 -0- 0	S: 90 -0- 0	S: 90 -0- 0
Interphalangeal Distal joint Extension & Flexion	2 nd	S: 0 -0 - 20	S: 0-0-20	S: 0-0-20	S: 0-0-20
	3 rd	S: 0 -0- 20	S: 0-0-20	S: 0-0-20	S: 0-0-20
	4 th	S: 0 -0- 20	S: 0-0-20	S: 0-0-20	S: 0-0-20
	5 th	S: 0 -0- 20	S: 0 -0- 20	S: 0 -0- 20	S: 0 -0- 20
Carpometacarpal Thumb Extension & Flexion		S: 10-0-30	S: 10-0-30	S: 10-0-30	S: 10-0-30
Thumb Opposition		Till the tip 5 th metacarpal.	Till the tip 5 th metacarpal.	Till the tip 5 th metacarpal.	Till the tip 5 th metacarpal.

Table 46 Final Hand ROM

HIP	ACTIVE [°]		PASSIVE [°]	
	<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion	S: 10 - 0 - 120	S: 10 - 0 - 110	S: 15 - 0 - 125	S: 15 - 0 - 120
Abduction & Adduction	F: 20 - 0 - 10	F: 20 - 0 - 10	F: 35 - 0 - 10	F: 30 - 0 - 10
External & Internal Rotation	R: 20 - 0 - 25	R: 20 - 0 - 25	R: 30 - 0 - 20	R: 30 - 0 - 20

Table 47 Final Hip ROM

KNEE & ANKLE	ACTIVE [°]		PASSIVE [°]	
	<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Knee Extension & Flexion	S: 0 – 0 – 110	S: 0–0–110 Painful	S: 0 – 0 – 110	S: 0–0–110 Painful
Ankle Dorsal & Plantar Flexion	S: 15 – 0 – 40	S: 15 – 0 - 40	S: 15–0–40 Painful	S: 20 – 0 – 50
Ankle Eversion & Inversion	R: 15 – 0 – 35	R: 20 – 0 – 35	R: 15–0–35 Painful	R: 20 – 0 - 40

Table 48 Final Leg ROM

METATARSAL PHALANGEAL JOINTS		ACTIVE [°]		PASSIVE [°]	
		<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion	1 st	S:70 – 0 –40	S: 75 – 0 -45	S: 75 -0- 50	S: 75 – 0 -50
	2 nd	S: 65 – 0 -45	S: 65 – 0 -45	S: 65 -0- 45	S: 65 -0- 45
	3 rd	S: 65 – 0 -40	S: 65 – 0 -40	S: 65 – 0 -45	S: 65 – 0 -40
	4 th	S: 65 – 0 -40	S: 65 – 0 -40	S: 65 – 0 -45	S: 65 – 0 -40
	5 th	S:65 – 0 - 40	S: 65 – 0 -40	S: 65 – 0 -45	S: 65 – 0 -40

Table 49 Final Toes ROM

CERICAL SPINE	ACTIVE [°]		PASSIVE [°]	
	<i>Left</i>	<i>Right</i>	<i>Left</i>	<i>Right</i>
Extension & Flexion	S: 35 – 0 – 35		S: 35 – 0 – 35	
Lateral Flexion	F: 20-0-35		F: 20-0-35	
Rotation	R: 40 – 0 – 50		R: 45 – 0 – 50 Painful	

Table 50 Final Cervical ROM

3.8.10 Muscle Length Test (Evaluation by Janda)

- **Grade 0** – no shortness
- **Grade 1** – slight / moderate shortness
- **Grade 2** – marked shortness

LEFT		RIGHT
Grade 1	Ankle plantar flexor Two joint (dorsiflex 10°)	Grade 1
Grade 0	Ankle plantar flexor One joint (knee flexed, dorsiflex 20° and more)	Grade 0
Grade 0	Hip flexors One Joint	Grade 0
Grade 1	Hip flexors Two joints	Grade 1
Grade 1	Hip Abductor	Grade 1
Grade 1	Hamstring Muscles	Grade 1
Grade 2	Paravertebral Muscles	Grade 2
Grade 2	Muscle Pectoralis major - Lower Sternum	Grade 2
Grade 1	Muscle Pectoralis major -Middle and upper sternal part	Grade 2
Grade 0	Muscle Pectoralis major - Clavicle part and pectorals minor	Grade 0
Grade 1	Muscle Pectoralis Minor (Kendall)	Grade 1
Grade 1	Cranial part of the Trapezius muscle	Grade 1
Grade 1	Levator Scapula	Grade 1
Grade 1	Sternocleidomastoid	Grade 1
Shortened (hard barrier and limited extension)	Scalene muscles (Kendall)	Shortened (hard barrier and limited extension)

Table 51 Final Muscle Length

3.8.11 Manual Muscle Strength Test (Evaluation by Kendall)

- **Grade 0:** No Contraction of the muscle.
- **Grade 1:** Contraction of the muscle felt but no movement seen.
- **Grade 2:** Position in horizontal plane with gravity.
- **Grade 3:** Against gravity.
- **Grade 4:** Against gravity with moderate resistance given.
- **Grade 5:** Against gravity with maximum resistance given.

LEFT	UPPER EXTREMITY (KENDALL)	RIGHT
Grade 4	Serratus Anterior (Supine)	Grade 3
Grade 4 Painful	Upper Trapezius	Grade 3
Grade 4	Lower Trapezius	Grade 4
Grade 3	Middle Trapezius	Grade 3
Grade 3	Rhomboid (PRONE)	Grade 3
Grade 3	Lateral Rotators of Shoulder (Teres Minor & Infraspinatus)	Grade 4
Grade 4	Shoulder Medial Rotators (Latissimus Dorsi, Pectoralis Major, Subscapularis, Teres Major) SUPINE	Grade 3
Grade 4	Pectoralis Minor	Grade 4
Grade 4	Pectoralis Major Lower	Grade 4
Grade 4	Pectoralis Major Upper	Grade 4
Grade 4	Deltoid	Grade 3
Grade 4	Triceps Brachii & Anconaeus	Grade 4
Grade 4	Biceps Brachii & Brachialis	Grade 4
Grade 3	Supinator & Biceps (Biceps shortened)	Grade 3
Grade 3	Pronator Teres & Quadratus	Grade 3
Grade 3	Extensor Carpi Ulnaris	Grade 3
Grade 3	Extensor Carpi Radialis Longus & Brevis	Grade 3
Grade 3	Flexor Carpi Ulnaris	Grade 3
Grade 3	Flexor Carpi Radialis	Grade 3
Grade 3	Flexor Digitorum Profundus	Grade 3
Grade 3	Flexor Digitorum Superficialis	Grade 3
Grade 3	Extensor Indicis, Extensor Digiti Minimi & Extensor Digitorum	Grade 3
Grade 3	Palmaris Longus	Grade 3
Grade 4	Lumbricales	Grade 3
Grade 3	Palmar Interossei	Grade 3
Grade 3	Dorsal Interossei	Grade 3
Grade 3	Flexor Digiti Minimi	Grade 3
Grade 3	Opponens Digiti Minimi	Grade 3
Grade 3	Abductor Digiti Minimi	Grade 3

Grade 3	Extensor Pollicis Brevis	Grade 3
Grade 3	Extensor Pollicis Longus	Grade 3
Grade 3	Flexor Pollicis Brevis	Grade 3
Grade 3	Flexor Pollicis Longus	Grade 3
Grade 3	Opponens Pollicis	Grade 3
Grade 3	Abductor Pollicis longus	Grade 3
Grade 3	Abductor Pollicis Brevis	Grade 3
Grade 3	Adductor Pollicis	Grade 3

Table 52 Final Upper Extremity Strength

LEFT	TRUNK (KENDALL)	RIGHT
Grade 5	Upper Abdominal muscles (Rectus Abdominis)	Grade 5
Grade 4	Anterior Neck Flexors (Longus Capitis, Longus Colli, Rectus Capiti Anterior, Sternocleidomastoid, Anterior Scalene, Suprahyoid, Infrahyoid.)	Grade 4
Grade 3	Anterolateral Neck Flexors (Sternocleidomastoid & Scalene)	Grade 3

Table 53 Final Trunk Strength

LEFT	LOWER EXTREMITY (KENDALL)	RIGHT
Grade 3	Gluteus Maximus (JANDA)	Grade 3
Grade 3	Tensor Fasciae Latae	Grade 2
Grade 4	Quadriceps Femoris	Grade 4
Grade 3	Hip Flexor Iliopsoas	Grade 3
Grade 3	Hip Adductors (Pectineus, Gracilis, Adductor Longus, Adductor Magnus & Brevis)	Grade 3
Grade 3	Gluteus Medius & Minimis	Grade 3
Grade 3	Lateral Rotator of Hip Joint (Quadratus Femoris, Obturator internus & externus, Gemellus Superior & Inferior, Piriformis)	Grade 3
Grade 3	Lateral & Medial Hamstrings (Bicep Femoris & Semimembranosus, Semitendinosus)	Grade 3
Grade 3	Tricep Surae (Ankle Plantar Flexor)	Grade 3
Grade 3	Peroneus Longus & Brevis (Plantar Pronator)	Grade 3
Grade 3	Tibialis Posterior (Plantar Supinator)	Grade 3
Grade 4	Tibialis Anterior (Dorsal Supinator)	Grade 3
Grade 3	Extensor Digitorum & Extensor Hallucis Longus & Brevis	Grade 2
Grade 3	Flexor Hallucis Longus & Brevis	Grade 3
Grade 3	Flexor Digitorum Longus	Grade 3
Grade 3	Flexor Digitorum Brevis	Grade 3
Grade 2	Plantar Interossei	Grade 2
Grade 2	Dorsal Interossei	Grade 2
Grade 3	Abductor Hallucis	Grade 3

Table 54 Final Lower Extremity Strength

3.8.12 Muscle Tone Palpation

○: Hypo tone ●: Hyper tone *: Physiological tone -: No reflex changes

REFLEX	LEFT	MUSCLES	RIGHT	REFLEX
-	●	Sternocleidomastoids	●	-
-	*	Anterior Scalene	*	-
-	*	Middle Scalene	●	Taut band
Local twitch response	●	Posterior Scalene	●	Taut band
-	●	Upper Trapezius	●	-
-	●	Levator scapulae	●	-
-	*	Deltoid	*	-
Trigger point	●	Supraspinatus	●	-
Trigger point	●	Infraspinatus	●	-
Trigger point	●	Rhomboid	●	Hypertrophy
-	*	Latissimus dorsi	*	-
-	●	Paravertebral muscles (Thoracic)	●	-
-	○	Biceps brachii	○	-
-	○	Triceps brachii	○	-
Taut band	●	Pectoralis major	●	-
-	●	Pectoralis minor	●	-
-	*	Diaphragm	●	-
More rigid	●	Tensor Fascia Latae	●	-
-	*	Quadriceps	*	-
-	*	Gluteus maximus	*	-
-	*	Piriformis	*	-
-	●	Biceps femoris	●	-
-	●	Medial Hamstrings	●	-
-	*	Plantaris	*	-
Swollen	●	Gastrocnemius	●	Swollen
Swollen	●	Soleus	●	Swollen
-	*	Hip Adductors	*	-

Table 55 Final Muscle Tone

3.8.13 Skin fold and Fascia Mobility Examination

Left		Right
No restriction.	Kibler Fold	Restricted at Lumbar region.
No Restricted	Deep Lumbar Fascia Caudally	No Restricted
No restriction	Deep lumbar fascia Cranially	No Restriction
No restriction	Dorsal fascia in transversal	Restriction
No restriction	Fascia of sides of trunk	Restriction
Slight Restriction	Scalp Fascia	Slight Restriction
Restriction	Cervicothoracic Junction (scapula to shoulder) Fascia	Restriction
No restriction	Upper Extremities (upper arm) Fascia	No restriction
No restriction	Upper extremities (forearm) Fascia	No restriction
No Restriction	Metacarpals Fascia	Slight Restriction
Restricted	Metatarsals Fascia	Restricted

Table 56 Final Skin Fascia Mobility

3.8.14 Basic Movement Pattern Examination (Janda Approach)

LEFT	MOVEMENT	RIGHT
<p>Quadratus lumborum+ paravertebral muscles, gluteal maximus and then the hamstrings were activated on the ipsilateral side. Pelvis was slightly tilted to the right side.</p>	<p>Hip Extension</p>	<p>Quadratus lumborum was activated first followed by the hamstring activation leading the gluteal muscle activation on the ipsilateral side. Shoulder girdle muscles were not activated much.</p>
<p>Gluteus medius & minimus + tensor fascia latae, quadratus lumborum activation; rectus femoris along with the abdominal muscle was activated than iliopsoas were activated.</p>	<p>Hip Abduction</p>	<p>Gluteus medius & minimus were active along the quadratus lumborum .Abdominal muscles were not active, rectus femoris was active followed by iliopsoas.</p>
<p>Pathological sign: The flexion began with head flexed with chin tucked in activating the abdominal muscles and anterior tilting of the pelvis causing the lower extremities to lift off the bed.</p>	<p>Trunk Flexion</p>	<p>Pathological sign: The flexion began with head flexed with chin tucked in activating the abdominal muscles and anterior tilting of the pelvis causing the lower extremities to lift off the bed.</p>
<p>Pathological sign: Continuous arch of the neck flexion but limited flexions due to shortened Sternocleidomastoid muscles. But the chin protracts during the move.</p>	<p>Neck/ Head Flexion</p>	<p>Pathological sign: Continuous arch of the neck flexion but limited flexions due to shortened Sternocleidomastoid muscles. But the chin protracts during the move.</p>
<p>Supraspinatus, deltoid and trapezius cranial part was activated, with less activation of the levator scapula.</p>	<p>Shoulder Abduction</p>	<p>Supraspinatus, deltoids, trapezius and levator scapula activation, quadratus lumborum was not activated; external rotation of inferior angle of scapula.</p>

Table 57 Final Movement Pattern

3.8.15 Deep Stabilisation System Examination (Kolář Approach)

LEFT		RIGHT
Head flexion followed by the trunk but the ribs moved laterally and the chest was positioned in inspiratory alignment.	Trunk Flexion Test	Head flexion followed by the trunk but the ribs moved laterally and the chest was positioned in inspiratory alignment.
The ribs were migrated laterally and then slightly cranial. Activation of the muscle was slightly weak against resistance.	Diaphragm test	The ribs were migrated laterally and then slightly cranial. Activation of the muscle was slightly weak against resistance.
Not Able to perform against resistance with slight activation of the lateral abdominal muscles.	Hip extension	Not Able to perform against resistance with slight activation of the lateral abdominal muscles.
The trunk shifted to the left side. Hip flexion was not performed against resistance. Lateral movements of the thigh.	Hip Flexion supine	Not able to perform hip flexion against resistance. Lateral movements of the thigh.
Intra-abdominal pressure was weak	Intra-abdominal pressure test	The diaphragm was activated first with abdominal lower area bowing out followed by abdominal muscles activation.

Table 58 Final Deep Stabilisation System

3.8.16 Joint Play Examination (Lewit Approach)

FEEL	LEFT	JOINTS	RIGHT	FEEL
Firm	Restricted in palmar flexion.	Wrist Radial Carpal	Restricted in Palmar Flexion.	Firm
-	Free	Wrist CMP	Restricted in Dorsal Flexion	Firm
-	Free	Thumb CMP	Restricted caudal.	Firm
-	Restricted in Radial duction.	Radial Ulnar	Restricted in Radial duction.	-
-	Free	Capitate bone	Restricted	-
-	Free	Pisiform bone	Restricted	-
-	Free	PIP	Free	-
-	Free	DIP	Free	-
-	Free	MCP	Free	-
-	Free	Elbow	Free	-
Firm	Restricted in caudal & cranial direction.	Shoulder	Restricted in caudal direction	Firm
-	Restricted in cranial caudal direction.	Sterno clavicular	Restricted in cranial caudal direction.	-
Hard.	Restricted in cranial direction.	Acromio clavicular	Restricted in cranial & caudal direction.	Painful.
-	Free	Scapula	Free	-
Firm	Restricted	Sacro Iliac	Restricted	Firm
-	Positive Spine sign.	Pelvis	Positive Spine sign.	-
Firm	Restricted	Talocrural	Restricted	Firm
Firm	Restricted	Subtalar & Talocalcaneo Navicular	Restricted	Firm
Firm	Restricted	Lisfranc & Chopart	Restricted	Firm
Firm	Restricted	MTP	Restricted	Firm

Table 59 Final Joint Play

3.8.17 Neurological Assessment

➤ **Mental State**

Consciousness and aware of the environment, place, time, date and situation and self-aware.

➤ **Higher Cerebral Function**

- Normal Cognitive skills
- Able to recall immediate, recent and remote memory.

➤ **Neck Examination**

Limited passive rotation & lateral flexion bilaterally due to muscle stiffness and pain at cervical spine.

➤ **Non Cortical Sensory of Upper and Lower Extremity Examination**

LEFT	LIGHT TOUCH	RIGHT
Normal	Shoulder C4	Normal
Normal	Forearm C6 & T 1	Normal
Normal	Thumb & Little Finger C6 & C8	Normal
Dull	Thigh L2	Dull
Dull	Calf L4 & L5	No Sensation
No Sensation	Toes	No Sensation

LEFT	PAIN	RIGHT
Normal	Shoulder C4	Normal
Normal	Forearm C6 & T 1	Normal
Sharp	Thumb & Little Finger C6 & C8	Sharp
Dull	Thigh L2	Dull
No Sensation	Calf L4 & L5	No Sensation
No Sensation	Toes	No Sensation

LEFT	DERMATOME SENSATION	RIGHT
Normal	C5	Normal
Normal	C6	Normal
Normal	C7	Normal
Normal	C8	Normal
Normal	L3	Normal
No sensation below knee.	L4	Sensation below knee.
No sensation below knee.	L5	Dull sensation below knee.
No Sensation	S1	No Sensation

Table 60 Final Non Cortical Sensory

➤ **Cortical Sensory System of Upper and Lower Extremities**

LEFT		RIGHT
Present	Graphesthesia	Present
Present	Kinaesthetic sensation	Present
Present	Stereognosis	Present
Present	Two point discrimination	Present

➤ **Cortical Sensory System of Lower Extremities**

LEFT		RIGHT
Not Present	Graphesthesia	Not Present
Not Present	Kinaesthetic sensation	Not Present
Not Present	Stereognosis	Not Present
Not Present	Two point discrimination	Not Present

Table 61 Final Cortical Sensory

➤ **Deep Tendon Reflexology of Upper & Lower Extremities**

LEFT		RIGHT
Normal	Biceps reflex (C5-C6)	Normal
Normal	Triceps reflex (C7)	Normal
Normal	Flexors (C8)	Hypo Reflexology
Hypo reflexology	Patellar reflex (L 2 – 4)	Hypo reflexology
Absent	Ankle jerk (L 5 – S 2)	Absent
Absent	Medio plantar reflex (L5 –S2)	Absent

Table 62 Final Deep Reflexes

➤ **Special Test**

Cup grip test	Positive on the right. Patient is not able to grip with the thumb, ring and middle finger.
Pincer grip test	Negative
Finkelstein Test	Positive bilateral
Tinel Sign: Wrist	Positive bilateral
Phalen's Test	Negative
Froment's Sign	Negative

Table 63 Final Special Test

➤ **Cerebellar Examination for Co-ordination**

Finger to nose	Normal but slower by the right hand
Heel – knee to shin	Normal

Table 64 Final Co-ordination Test

➤ **Vestibular Apparatus Examination**

Hauntant test	Normal
De kleyne test	Felt dizzy when turned to right.
Fukuda – unterberger stepping test	Positive
Walking on the line test	Negative

Table 65 Final Vestibular Apparatus

3.9. Final kinesiology Examination Conclusion

The final kinesiology examination of KK ensued astonishing improvement in many factors that were set up as a goal of the therapy aimed to improve. The main focused of the therapy was of the hands in such a way that would help the patient with maintaining her ADL functions. Overall on the pain scale level it reduced to 4-5/10 of the hands bilaterally.

Firstly, in general improved reduction in pain and swelling resulted from the therapy. The movement of the hands motion improved with increasing grip strength and ability especially on the right. Patient was able perform opposition of the thumb without imposing so much stress upon it; PIP and DIP joint of the fingers motion increased; the adduction especially of the thumb and 2nd finger of the right enhanced. As a result, the free joint mobility caused the improved ROM and the surrounding tissues mobility increased with improved strength of the hand muscles.

Secondly, patient happily expressed her feeling the activation of the muscle pull on her left foot plantar after several years. The positive neuropathology on the lower extremities was improved as the patient expressed her feeling the sensation during the dermatome test. The hammer toes activation into extension during the therapy exercises for balance especially of the left showed advancement.

Thirdly, she was observed correcting her posture after educating her the corrective posture for her, whenever she realised it.

To end, the desired goal of the therapy was somewhat achieved according to the patients ability. Which was pain reduction and improving the mobility of the hands and its grip strength; relaxing the hyper toned muscles especially the upper body postural muscles to improve the motion of the head and neck; activation of the diaphragm improved the breathing ability; balance training resulted in educating proper gait and posture.

4. Evaluation

4.1. Therapy effect & Initial to Final Examination comparison

All the therapy was performed in chronological order i.e. everything was first done on the upper extremities and then moved to the lower extremities; superficial therapy treatment and then the deeper.

The pain of the hands reduced from the initial to final session, due to the use of lymphatic massage and soft tissue techniques using the foam ball helped in reducing the swelling.

Pain Level (Hands)	
INITIAL	FINAL
7/10	5/10

Table 66 Pain Level Comparison

Breathing exercises were performed with modification using the wooden stick and Thera band; it commenced the facilitating activation of the lower ribs, diaphragm, and upper coastal ribs by applying pressure and education of the corrective breathing pattern helped in improving the breathing wave pattern.

Breathing Examination	
INITIAL	FINAL
Abdominal breathing.	Abdominal and lower ribs breathing.

Table 67 Breathing Comparison

Corrective gait was educated to the patient by showing the correct movement of the foot during the walking. Modified gait therapies included the soft pad, balance board, mirror for visual understanding, walking on narrow base, walking with wide base, corrective hip and knee flexion and extension; along with sensorimotor stimulation of the foot by using the spiky ball, foot arch formation while focusing on the “three points”, standing on the balance pad with single leg, both legs and eyes closed. All these helped in patient to focus and correct the gait and balance overall.

Gait		
EXAMINATION	INITIAL	FINAL
Stride length	Asymmetrical; right leg takes smaller step forward than the left.	Symmetrically focusing on taking same length steps.
Movement of the foot	Toe off – Using more of the metatarsal joints.	Toe off – ideally focusing on using her toes to take off.
Walking on narrow base	Patient loses balance after 3 steps.	Patient loses balance after 5 steps.
Walking backwards	Patient deviates towards the left side, with limited hip extension bilaterally.	Patient deviates towards the left side, with improved hip extension on right.

Table 68 Gait Comparison

The joint mobilization helped in eliminating the restricted joint play by using the manipulation technique by Lewit. It was done almost every day especially of the hands small joints, with caution of not provoking any pain or any other discomfort. This technique then further helped in improving the ROM of the joints. In addition, conditional exercises were done, that helped in manipulating and initiating the motion of the hands in various forms which would help the patient with ADL.

ROM [°] & End Feel								
INITIAL				EXAMINATION	FINAL			
<i>Left</i>		<i>Right</i>			<i>Left</i>		<i>Right</i>	
<i>Active</i>	<i>Passive</i>	<i>Active</i>	<i>Passive</i>		<i>Active</i>	<i>Passive</i>	<i>Active</i>	<i>Passive</i>
75	75	70	70	Wrist Flexion	80	80	75	75
Firm and painful 7/10.				Wrist Extension's End Feel	Painful 4/10			
15	20	10	10	Thumb MCP Flexion	30	30	20	20
85	85	80	80	MCP Flexion	90	90	85	85
F:20 - 0 - 25	F:20 - 0 - 25	/	/	Thumb CMP Abduction & Adduction	F: 30 - 0 - 35	F: 30 - 0 - 35	/	/
/	/	F: 10 - 0 - 5	F: 20 - 0 - 10	2nd & 3rd MCP Abduction & Adduction	/	/	F: 20 - 0 - 15	F: 20 - 0 - 15
F: 20 - 0 - 10	F: 20 - 0 - 10	F: 20 - 0 - 10	F: 20 - 0 - 10	MCP Abduction & Adduction	F: 20 - 0 - 15	F: 20 - 0 - 15	F: 20 - 0 - 15	F: 20 - 0 - 15
/	/	20 Painful		Thumb IP Flexion	/	/	40 Painful	
S:5-0- 20	S:5-0- 20	S:5-0- 20	S:5-0- 20	Thumb CMP Extension & Flexion	S: 10 - 0 - 30	S: 10 - 0 - 30	S: 10 - 0 - 30	S: 10 - 0 - 30
Till the tip 3rd & 4th metacarpal. Painful.				Thumb Opposition	Till the tip 5th metacarpal. Less Painful			
/	/	60	60	MTP Extension	/	/	65	65
/	/	20	/	Cervical Spine Lateral Flexion	/	/	35	/
/	/	40	/	Cervical Spine rotation	/	/	50	/

Table 69 ROM Comparison

Joint Play				
INITIAL		EXAMINATION	FINAL	
<i>Left</i>	<i>Right</i>		<i>Left</i>	<i>Right</i>
Restricted caudal & cranial bilateral.		CMP of thumb	Free	Restricted caudal
Radial & ulnar duction restriction. Caudal & Cranial direction restriction.		Radial Ulnar Joint	Restricted in radial duction.	
Restricted in cranial caudal & laterolateral direction.		PIP,DIP,MCP Joints	Free	
Restricted	/	Capitate bone	Free	/
Restricted	/	Pisiform bone	Free	/

Table 70 Joint Play Comparison

The skin & fascia physiological mobility was restored by doing the fascia release technique by Lewit.

Skin & Fascia				
INITIAL		EXAMINATION	FINAL	
<i>Left</i>	<i>Right</i>		<i>Left</i>	<i>Right</i>
Restricted at thoracic and lumbar region.		Kibler Fold	Physiological at thoracic and lumbar region.	Physiological at thoracic region.
Restricted.		Deep lumbar fascia Cranially & Caudal	No restriction.	
Firm restriction.		Scalp fascia	Slight restriction.	
Firm restriction.		Metacarpals Fascia	Slight restriction.	

Table 71 Skin & Fascia Comparison

Post Isometric Relaxation technique by Lewit was done to restore the physiological tone of the hyper toned muscles. This technique helped to reduce the tone of the muscles enough to aid the patient to improve the exercising quality, this further effected the length and strength of the muscles regardless of the tone progress. The length was improved by performing the reciprocal inhibition by using the length test techniques by Janda and Kendall paired with breathing principles of PIR. Patient was also educated on self PIR therapy to be performed at home, in order to maintain the relax tone of the muscles.

INITIAL - Left	Muscle Tone	FINAL - Left
Hyper tone	Diaphragm	Physiological normal tone.

Table 72 Muscle Tone Comparison

Muscle Strength				
INITIAL		EXAMINATION	FINAL	
<i>Left</i>	<i>Right</i>		<i>Left</i>	<i>Right</i>
Grade 2 painful		Extensor Pollicis Brevis	Grade 3	
Grade 2 painful		Flexor Pollicis Brevis	Grade 3	
Grade 2 painful		Abductor Pollicis Brevis	Grade 3	
/	Grade 2 painful	Palmaris Longus	/	Grade 3
/	Grade 2 painful	Extensor Indicis, Extensor Digiti Minimi & Extensor Digitorum	/	Grade 3
Grade 2 painful	Grade 1 painful	Flexor Digitorum Superficialis	Grade 3	
Grade 3 painful	Grade 2 painful	Flexor Digitorum Profundus	Grade 3	
Grade 2 painful		Flexor Carpi Radialis	Grade 3	
Grade 3 painful	Grade 2 painful	Extensor Carpi Radialis Longus & Brevis	Grade 3	
/	Grade 2	Abductor Hallucis	/	Grade 3

Table 73 Muscle Strength Comparison

Muscle Length				
INITIAL		EXAMINATION	FINAL	
<i>Left</i>	<i>Right</i>		<i>Left</i>	<i>Right</i>
Grade 2		Trapezius Cranial part	Grade 1	
Grade 2		Sternocleidomastoid	Grade 1	
/	Grade 2	Levator Scapula	/	Grade 1

Table 74 Muscle Length Comparison

Sensorimotor stimulation and myofascial release of the hands and feet were done using the spiky ball, balance pad and BOSU ball. This helped not only releasing the myofascial but also actuated in improving the balance by proprioception stimulations of the feet. Triggering of the hand proprioception helped in improving the grip. On the bright side, patient elaborated her achievement in feeling the activation of the muscles on her left foot for the first time in 3 years. Therefore, improvement in the neurological sensation and reflexes demonstrated effectively.

Neurological				
INITIAL		EXAMINATION	FINAL	
<i>Left</i>	<i>Right</i>		<i>Left</i>	<i>Right</i>
/	Dull sensation below the knee.	Dermatome sensation L4	/	Sensation below the knee
Hypo sensation	/	Deep tendon Flexor Reflexology C8	Normal physiological sensation.	/
/	Positive	Froment's Sign	/	Negative
/	Positive & not able to pincer and hold the ball between the thumb and the ring & middle finger	Pincer grip test	/	Negative
Positive		Walking on the line Vestibular Test	Negative	

Table 75 Neurological Comparison

4.2. Prognosis

Rheumatoid arthritis is a chronic disease, the course of which is most often gradual with various remission. Since, it is still the beginning of RA with mild symptoms in the patient, the prognosis of RA progressive destruction was slackened. Mainly the success of the physiotherapy rehabilitation treatment, which was focused on the maintaining the normal ROM of the small joints of hands especially, that engaged in ergonomics of the patient to not lose her functionality of ADL.

As mentioned above, the prognosis of the patient to improve, showed favourable outcomes despite of the disease progression; it was only possible by the patient's motivation to participate in the therapy and perform the self-therapy at home that was educated at the end of each session.

KK, the patient started her biological treatment right after the last session, which will potentially help the patient to improve greatly from the disease.

5. Conclusion of Case Study

The clinical practice took place at Revmatologický ústav (Institute of rheumatology); and the case study of the diagnosis Rheumatoid arthritis was assigned for the Bachelor Thesis. The practice itself at the rheumatology institute helped in understanding and acquiring the knowledge of different types of rheumatoid diseases, apart from Rheumatoid arthritis, not only practically but also theoretically.

As an autoimmune disease, RA is incurable and can only affect its symptoms and course. Depending on the stage and degree of disease, patients experience various types of symptoms, along with intensities of pain and deformities. The practice convinced that if caution and care is taken at earlier stages and with will and dedication of the patient, the progress of the disease can be slowed down, in the form of deformities and limited motion.

In addition, not only the physiotherapeutic therapy of the musculoskeletal system, but also psychological care with pharmacological treatment collaboration can be remarkably effective on the disease.

Nearly all the predetermined short-term goals were met, along with promising progression to long term goals and the patient herself evaluated everything positively.

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7.3. Abbreviations

- ACL – Anterior cruciate ligament
- ACPAs- Anti-Citrullinated Protein Antibodies
- ADL – Activities of Daily Living.
- anti-CCPs - anti-cyclic citrullinated peptides
- CMP – Carpometacarpal phalangeal Joints.
- CRP – C-reactive protein
- DIP – Distal Interphalangeal Joints
- DMARDs – Disease-modifying anti rheumatic drug
- E.g. - example
- ESR – Erythrocyte sedimentation rate
- Etc. - Et cetera
- GI – Gastrointestinal tract
- i.e. - “that is”
- MCP – Metacarpal Joints
- MRI - Magnetic resonance imaging
- MTP – Metatarsal phalangeal Joints.
- NSAIDs – Non-steroidal anti-inflammatory drugs
- OA - Osteoarthritis
- PIP – Proximal Interphalangeal joints
- PIR – Post Isometric Relaxation (Lewit)
- PNF - Proprioceptive neuromuscular facilitation (Kabat)
- RA – Rheumatoid Arthritis
- ROM – Range of Motion
- SFTR – Sagittal Frontal Transverse Rotation
- TBC - Tuberculosis or tuberkulóza
- TNF-a antagonist – Tumour Necrosis Factor Antagonists
- TSM – Tarso metatarsal joint
- UTP –umělé přerušeni těhotenství / Abortion

8. Supplements

8.1 Hand Photos from Initial and Final



Figure 5 before Therapy Hands.



Figure 6 after therapy Hands.

8.2 Application Approval by the UK FTVS Ethics Committee

CHARLES UNIVERSITY
FACULTY OF PHYSICAL EDUCATION AND SPORT
José Martího 31, 162 52 Prague 6-Vešelavín

Application for Approval by UK FTVS Ethics Committee

of a research project, thesis, dissertation or seminar work involving human subjects

The title of a project: Physio Therapy Case study of Rheumatoid Arthritis

Project form: Bachelor Thesis

Period of realization of the project: January 2018

Applicant: Mahera Mukhtar, UK FTVS – Physiotherapy

Main researcher: Mahera Mukhtar, UK FTVS – Physiotherapy

Workplace: REVMATOLOGICKÝ ÚSTAV

Supervisor: Kateřina Maršáková

Project description: Case study of a rheumatoid patient diagnosed with rheumatoid arthritis. The aim of the study is to apply physiotherapy procedures and to observe and evaluate the results of the rehabilitation therapy used. The methods used to collect data were observations, questionnaire, specific physiotherapy examinations, non-invasive assessments, short and long term rehabilitation plan, differential diagnoses and non-invasive physiotherapeutic methods. All based on the knowledge acquired during the three year Bachelor degree Physiotherapy program at UK-FTVS.

Characteristics of participants in the research: One female patient aged 71, diagnosed as seronegative rheumatoid arthritis. The only contra indication is the ability to not go beyond the acceptable pain levels. All the examinations and sessions are done under the supervisor's guidance. Risks of therapy and methods will not be higher than the commonly anticipated risks for this type of therapy. The physical presence of the responsible supervision Mgr. Markéta Mikulášová.

Ensuring safety within the research: No invasive methods were used as none were required.

Ethical aspects of the research: All data obtained during the research will strictly be used only for the Bachelor thesis and possible further research at UK FTVS. I shall ensure to the maximum extent possible that the research data will not be misused. No photos or video will be taken during the research.

Informed Consent: attached

It is the duty of all participants of the research team to protect life, health, dignity, integrity, the right to self-determination, privacy and protection of the personal data of all research subjects, and to undertake all possible precautions. Responsibility for the protection of all research subjects lies on the researcher(s) and not on the research subjects themselves, even if they gave their consent to participation in the research. All participants of the research team must take into consideration ethical, legal and regulative norms and standards of research involving human subjects applicable not only in the Czech Republic but also internationally. I confirm that this project description corresponds to the plan of the project and, in case of any change, especially of the methods used in the project, I will inform the UK FTVS Ethics Committee, which may require a re-submission of the application form.

In Prague, 23rd of January, 2018

Applicant's signature:

Approval of UK FTVS Ethics Committee

The Committee: Chair: doc. PhDr. Irena Parry Martinková, Ph.D.

Members: prof. PhDr. Pavel Slepíčka, DrSc.
doc. MUDr. Jan Heller, CSc.
PhDr. Pavel Hráský, Ph.D.
Mgr. Eva Prokešová, Ph.D.
MUDr. Simona Majorová

The research project was approved by UK FTVS Ethics Committee under the registration number: 040/2018
Date of approval: 24.1.2018

UK FTVS Ethics Committee reviewed the submitted research project and found no contradictions with valid principles, regulations and international guidelines for carrying out research involving human subjects.

The applicant has met the necessary requirements for receiving approval of UK FTVS Ethics Committee.

UNIVERZITA KARLOVA
Fakulta tělesné výchovy a sportu
José Martího 31, 162 52, Praha 6
Stamp of UK FTVS

Signature of the Chair of
UK FTVS Ethics Committee

INFORMOVANÝ SOUHLAS

Vážená paní, vážený pane,

v souladu se Všeobecnou deklarací lidských práv, zákonem č. 101/2000 Sb., o ochraně osobních údajů a o změně některých zákonů, ve znění pozdějších předpisů, Helsinskou deklarací, přijatou 18. Světovým zdravotnickým shromážděním v roce 1964 ve znění pozdějších změn (Fortaleza, Brazílie, 2013) a dalšími obecně závaznými právními předpisy Vás žádám o souhlas s prezentováním a uveřejněním výsledků vyšetření a průběhu terapie prováděné v rámci praxe na, kde Vás příslušně kvalifikovaná osoba seznámila s Vaším vyšetřením a následnou terapií. Výsledky Vašeho vyšetření a průběh Vaší terapie bude publikován v rámci bakalářské práce na UK FTVS, s názvem

Získané údaje, fotodokumentace, průběh a výsledky terapie budou uveřejněny v bakalářské práci v anonymizované podobě. Osobní data nebudou uvedena a budou uchována v anonymní podobě. V maximální možné míře zabezpečím, aby získaná data nebyla zneužita.

Jméno a příjmení řešitele Podpis:.....

Jméno a příjmení osoby, která provedla poučení..... Podpis:.....

Prohlašuji a svým níže uvedeným vlastnoručním podpisem potvrzuji, že dobrovolně souhlasím s prezentováním a uveřejněním výsledků vyšetření a průběhu terapie ve výše uvedené bakalářské práci, a že mi osoba, která provedla poučení, osobně vše podrobně vysvětlila, a že jsem měl(a) možnost si řádně a v dostatečném čase zvážit všechny relevantní informace, zeptat se na vše podstatné a že jsem dostal(a) jasné a srozumitelné odpovědi na své dotazy. Byl(a) jsem poučen(a) o právu odmítnout prezentování a uveřejnění výsledků vyšetření a průběhu terapie v bakalářské práci nebo svůj souhlas kdykoli odvolat bez represí, a to písemně zasláním Etické komisi UK FTVS, která bude následně informovat řešitele.

Místo, datum

Jméno a příjmení pacienta Podpis pacienta:

Jméno a příjmení zákonného zástupce

Vztah zákonného zástupce k pacientovi Podpis: