CHARLES UNIVERSITY IN PRAGUE

FACULTY OF PHYSICAL EDUCATION AND SPORT

DEPARTMENT OF PHYSIOTHERAPY

Case Study of Physiotherapy Treatment of a Patient with the Diagnosis of Anterior ST-segment elevation myocardial infraction

Bachelor's thesis

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ABSTRACT

Title of the thesis: Case Study of Physiotherapy Treatment of a Patient with the Diagnosis of Anterior ST-segment elevation myocardial infraction

Thesis aim: This thesis involves a case study approach regarding to a patient with Anterior ST-segment elevation myocardial infraction. Theoretical part describes the anatomy and physiology of the heart, specifically the muscle of the heart, arteries, veins and the valves. Information about biomechanical point of view is also discussed. In the practical part I analyze every procedure I have done with my patient, all the examinations, conclusions, therapies and results.

Methods: The practical part is based on a 43 years old female, who was diagnosed Anterior ST-segment elevation myocardial infraction. This study consists of the physiotherapeutic approaches for initial kinesiologic examination, followed by 8 therapy sessions lasting an hour and a half each, and the final kinesiologic examination. All methods used were non-invasive.

Result: The progress of my patient was remarkable after 8 sessions of therapy. Pain level was decreased, range of motion was improved, muscle tone was improved and also her posture and gait. The therapies have shown to be very effective concerning my patient's diagnosis.

Conclusion: After finishing all my therapies, results were very satisfying according my patient's diagnosis. Therefore, the prognosis of my patient is relative good because her diagnosis morbidity is very high.

Keywords: Anterior ST-segment elevation, spasticity, myocardial infraction, physiotherapy, rehabilitation, heart attack, case study

DECLARATION

I declare that this bachelor thesis was written by me independently and by the instructions of my supervisor PhDr. Lenka Satrapova, Ph.D. It is an original research, which refers on practice with patient after diagnosis of Anterior ST-segment elevation myocardial infraction, under the supervising of BSc. Tomas Modlinger. My practice took place at Kladno hospital, in Kladno.

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

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

Prague, April 2016 **Ioannis Hadjiyiannis**

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First of all, I would like to thank all of the professors that educated and helped me during the last 3 years of my studies in Charles University. I also want to express my special thanks to PhDr. Lenka Satrapova, Ph.D. for guiding me through my bachelor thesis and supervision, which is much appreciated.

Also special thanks to BSc Tomas Modlinger, who was my supervisor in Kladno Hospital, and guided me and helped me to complete the practical part of my bachelor thesis.

Special thanks to my colleague Panagiotis Savvopoulos, that he was standing next to me in every situation, by helping me and guiding me for this 3 years in our University, and also to my friends Sophia Tzioni, Christodoulos Tsaggarou, Yousef Musabih, Rashid Musabih, Christoforos Kouppari, Angela Evangelou and Minas Kouroglou for the psychological support all these years.

DEDICATION

I would like to dedicate this bachelor thesis to my family for giving me the opportunity to make my dreams true and study physiotherapy in Charles University and also for their valuable support during my studies. I also would like to dedicate it to my grandmother that passed out 1 year before.

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1. Introduction

My physiotherapy program took place at Kladno Hospital, in Kladno. Physiotherapy program started on Monday 18th of January 2016 and ended on Friday 29th of January 2016.

The case study of physiotherapy treatment that I chose was for a patient with Anterior ST-segment elevation myocardial infraction, 2 months after her operation. I chose for my bachelor thesis this patient, because I have a big interest in neurological disorders and I would like to follow my master degree in neurological conditions.

Goals of the therapy sessions were to decrease pain, decrease spasticity, increase range of motion, and strengthen affected muscles.

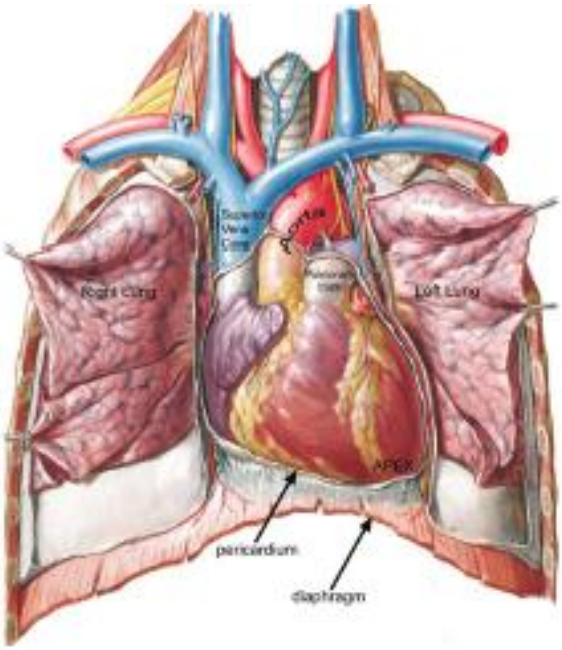
Thesis is divided into two parts. Theoretical part describes the anatomy and physiology of the heart, specifically the muscle of the heart, arteries, veins and the valves. Information about biomechanical point of view is also discussed. In the practical part I analyze every procedure I have done with my patient, all the examinations, conclusions, therapies, results, goals and evaluation of the effect of the therapy are mentioned.

2. General Part

2.1 Anatomy and Physiology of the heart

2.1.1 Location of the heart

Heart is located into the thoracic cavity, in between the lungs, in the space known as mediastinum. Into the mediastinum there are a lot of structures, and what makes heart separated from this structure is another tough membrane called pericardium. The posterior surface of the heart lies close to the bodies of the vertebras and its anterior surface is located deep to the sternum and the costal cartilages. The great arteries (aorta and pulmonary trunk) and the great veins (superior and inferior vena cava) are attached to the base of the heart, which is located superiorly. [5]



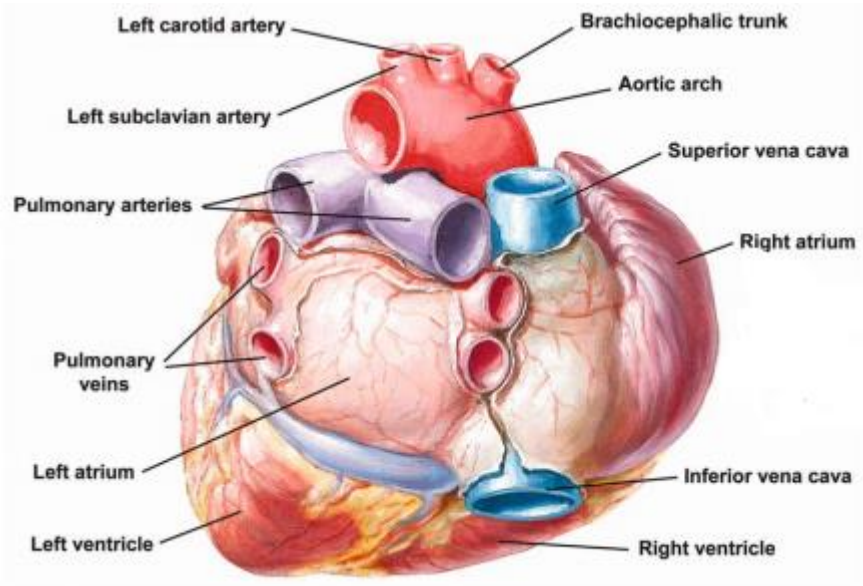
Picture 1- General structure and location of the heart [7]

2.1.2 Chambers and Circulation through the heart

Our heart consists of 4 chambers which are the left atrium, the left ventricle, the right atrium and the right ventricle. The atriums are responsible for receiving blood and contract to push the blood to the lower chambers, and ventricles are the primary pumping chambers which then send the blood to the lungs or to the rest of the body. [13]

There consist two circuits of human circulation, the pulmonary and the systemic circuit. The transfer of the blood and what blood carries to and from the lungs belongs to the pulmonary circuit, where the blood picks up oxygen and deliver carbon dioxide for exhalation. In the systemic circuit, the oxygenated blood its transported all over the body, in all the tissues, and then the blood comes back to the heart deoxygenated to be sent back to the pulmonary circuit. [15]

The deoxygenated blood is transferred after right ventricle pumping, into the pulmonary trunk which leads to the trunk and is divided to the left and right pulmonary arteries. It's the only artery in our body, which after birth carry relatively deoxygenated blood. Then, after has exchange occurs, high oxygenated blood returns to the lungs by the only vein, pulmonary vein, which after birth carries high oxygenated blood, to the left atrium, which pumps the blood to the left ventricle, which then pumps the oxygen to the aorta, and then to many branches of the systemic circuit. These vessels will eventually lead to the systemic capillaries where they will exchange products with the tissue fluid and cells, where oxygen and nutrients will exit the systemic capillaries and carbon dioxide and waste products will enter the blood. After the exchange is done, the capillaries will unite to form the superior and inferior vena cava, which will finally return the blood to the right ventricle. [9]



Picture 2- Main arteries and veins of the heart [7]

2.1.3 Membranes

The first membrane that surrounds the heart is called pericardium. Pericardium consists of two sub layers, which are the fibrous pericardium and the inner serous pericardium. The fibrous pericardium, it's the one that is tough in structure, which protects the heart and also maintains heart position in the thorax. [5]

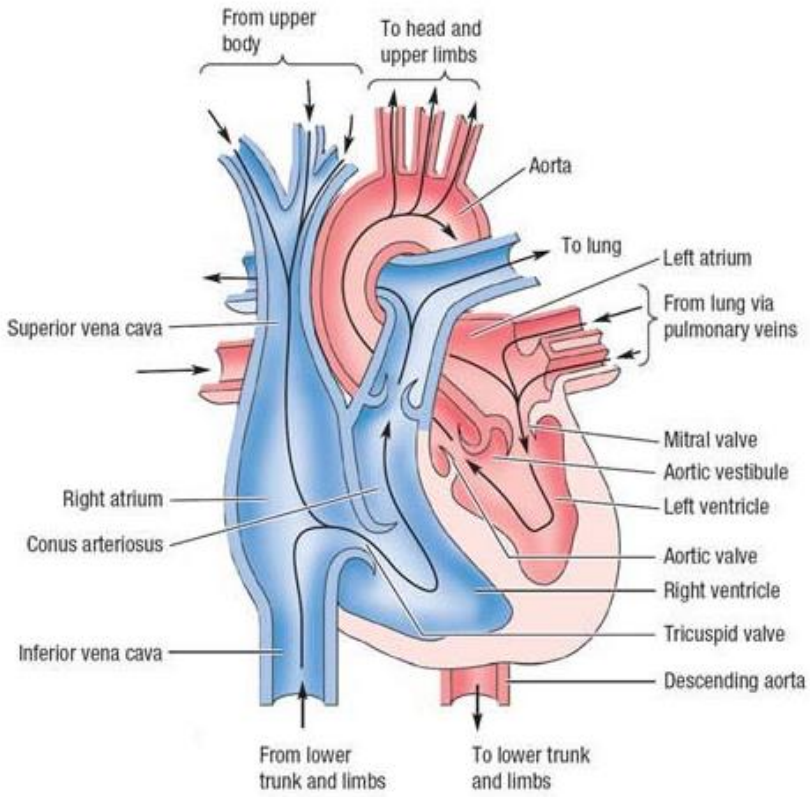
2.1.4 Layers

There are 3 layers which compose the wall of the heart. The outermost layer is called epicardium, the innermost layer is called endocardium and in between consists the myocardium. Myocardium is mostly consists of cardiac muscle cells, and its contraction is what makes the chambers to pump the blood through the heart into the major arteries. [11]

2.1.5 Internal Structure of the heart

There are some extensions of the myocardium which are dividing the two atria and the two ventricles which are called septa. Atriums are separated by the interatrial septum, ventricles are separated by the interventricular septum and the division of atriums and ventricles is done by the interventricular septum. Each atrium and septum has an opening, which is called valve, which is a specialized structure which ensures that the blood will flow only in one way. The valves which flow the blood from atriums to ventricles are called atrioventricular valves, and the valves that lead the blood to aorta and pulmonary trunk are known as semilunar valves. Because these valves and their openings weaken the atrioventricular septum, there is a connective tissue called cardiac skeleton, which reinforces the remaining tissue, and also has an important role in the electrical conduction system of the heart. [10,21]

Blood is served into the right atrium by the inferior and superior vena cava and by the coronary sinus which is a large coronary vein. Superior vena cava is responsible to deliver blood from the structures that are located cranially to the diaphragm, and inferior vena cava from the structures that are located caudally to the diaphragm. The opening of the coronary sinus is located superiorly, posteriorly and medially to the inferior vena cava, and serves blood from thin walled vessels which drained it from the coronary veins of the systemic blood from the heart. The blood is continually flowed into the right atrium and then is served to the right ventricle by the tricuspid valve. [19,21]



Picture 3- Internal structure of the heart [12]

The myocardium of the right ventricle contracts, and thanks to that pressure in the right ventricle arises, and the blood has to be exchanged, like all the fluids, from higher pressure to lower pressure, so the blood flows to the pulmonary trunk, which then is separated to the left and right pulmonary arteries which will carry it to each lung. This exchange is achieved by the help of the pulmonary semilunar valve, which is located in the base of the pulmonary trunk. Then the blood in the lungs, exchanges gases, and blood high in concentration of oxygen is delivered to the left atrium by one of the four pulmonary veins. Then the blood is served to the left ventricle by the mitral valve, which is the biggest pumping chamber that will flow the blood into the aorta, through the aortic semilunar valve to the systemic circuit. All the valves which are mentioned above are preventing back flow of the blood, from ventricles to atriums. [10,19]

2.1.6 Arteries

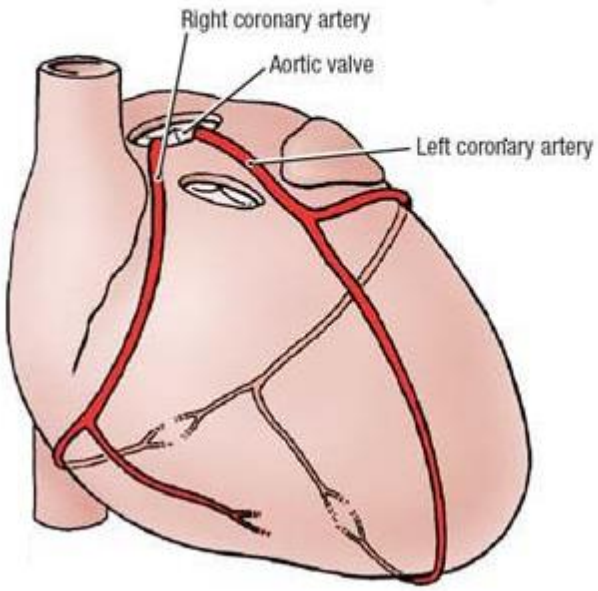
Arteries are the blood vessels which are responsible to transfer the blood away from the heart. They are formed with relatively thick walls to be able to bear the high pressure of blood that exits the heart. As close an artery is to the heart, it consists of thickest wall, and higher percentage of elastic fibres. If the arteries wasn't so thick and the elastic percentage was lower, it would cause resistance to the blood flow which flows through them, in resulting blood pressure to rise in higher levels, resulting an increase to the volume of blood. Far from the heart, arteries are not that elastic and they contain greater amount of smooth muscles, and they are called muscular arteries. [6,15]

2.1.7 Veins

Veins are blood vessels that conduct blood toward the heart. In comparison with the arteries, they are thicker and have large lumens. Veins are also low pressure vessels, so they contain valves to be able to carry the blood to the heart, and prevent backflow. [6]

2.1.8 Coronary arteries

Coronary arteries main function is to serve blood to myocardium and other structures of the heart. The left coronary artery is formed by the left posterior aortic sinus, and the right coronary artery is formed by the anterior aortic sinus. The left coronary artery is responsible for the distribution of the blood to the left side of the heart mainly, and with some small branches. The larger anterior interventricular artery, which is known as left anterior descending artery is arising also from the left coronary artery. This artery along its way forms a lot of smaller branches that interconnect the branches of the posterior interventricular artery, to give rise anastomoses. Anastomoses normally allow the blood to circulate to a region even if there may be a partial blockage in another branch. But these anastomoses in the heart are so small, so therefore their ability in the heart is restricted, so blockages in a coronary artery will most of the times cause death of the cells, and this is what we call myocardial infraction. [3,6]



Picture 4- Coronary arteries of the heart [12]

2.1.9 Coronary veins

The great cardiac vein receives several major branches, which some of them is the posterior, middle and small cardiac vein which each one is responsible to drain some branches which are supplied by the coronary arteries. [6]

2.1.10 Structure of Cardiac Muscle

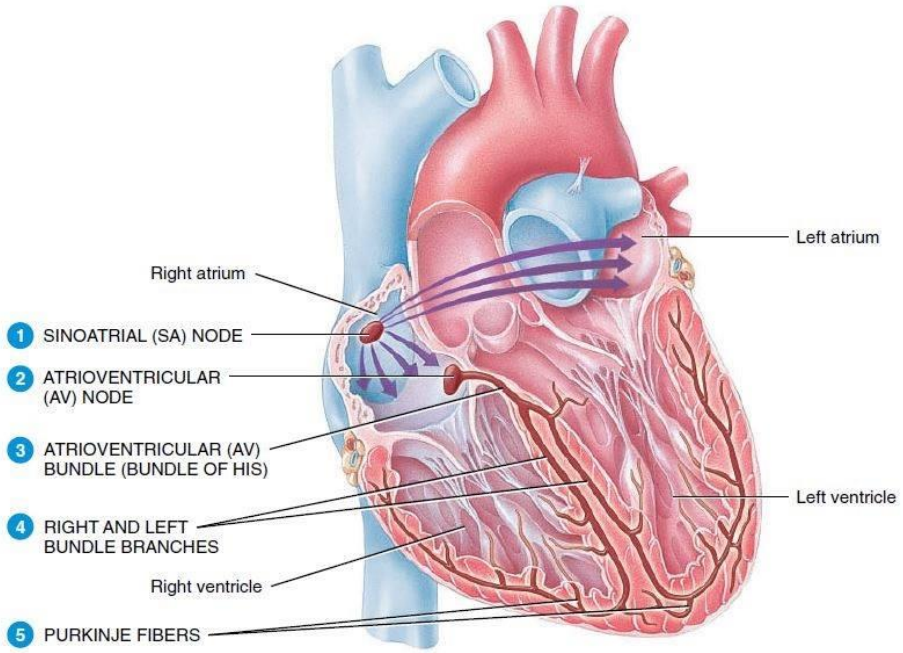
Cardiac muscle cells are shorter and much smaller in diameter compared to the cylinders of skeletal muscles. Striations are demonstrated by the cardiac muscles, which are the dark A bands and light I bands that arrange the myofilaments and fibrils that are organized in sacromeres along the length of the cell. Also in the cardiac muscles, there exist some T tubules which are found in the junction of the A and I bands. These tubules in cardiac muscles are the half of the tubules that are in skeletal muscles and this result in slower onset of contraction. Mitochondria are high in concentration and they are providing energy for the contractions of the heart. Two neighbour cells are banded together by an intercalated disc, which synchronizes the contraction of the muscle. Cardiac muscle is metabolizing lipids and carbohydrates to undergo the aerobic respiratory patterns. It also undergo twitch-type contractions which have long refractory periods, to prevent the possibility of tetany, and its followed by short relaxation periods

which are essential for the heart to be able to fill up with blood for the next cycle. [13,14]

2.1.11 Cardiac Conduction

The sionoatrial (SA) node, establishes the normal cardiac rhythm, which is formed by specialized myocardial conducting cells which are located in the superior and posterior walls of the right atrium. It is also known as the pacemaker of the heart, and it has the highest inherent rate of depolarization. It initiates the sinus rhythm which is followed by the contraction of the heart. The sinus rhythm, is spread through specialized intermodal pathways to the atrial myocardial contractile cells and the AV atrioventricular node. [9]

The atrioventricular (AV) node is the second part of myocardial conductive cells, which is located I the inferior portion of the right atrium into the atrioventricular septum. This is very important because that's how it prevents the impulse to be spread along the ventricles. There is a delay before AV node depolarizes and transmits the impulse to AV bundle, which is critical to the heart function, because it allows the atrial cardiac muscle cells to complete their contraction which will lead the blood flow to the ventricles, before the impulse will be spread to the ventricle cells. If extreme stimulation of the SA node exist the AV node can transmit up to 220 impulses per minute, and this is what give us the typical maximum HR in a young individual. [9,19]



Picture 5- Cardiac Conduction of the heart [7]

2.1.12 Frank-Starling law

Frank-Starling law explain us the relationship between ventricular stretch and contraction. His principle states that in physiological limits, the force of the heart contraction is directly proportional to the initial length of the muscle fibre. This means that the greater the stretch of the ventricular muscle, the more powerful the contraction is, which increases stroke volume. [17]

2.1.13 Heart Rate and Cardiac Output are related

In physiological conditions, when heart rate will increase eventually stroke volume will have an increase. So as the heart rate will increase, there will be less time spent in diastole of the heart, so there will be less time for the ventricles to receive blood from the atriums, but even if the blood will be less in the ventricles stroke volume will remain in high levels. If heart rate will be still increasing, stroke volume will start slowly to decrease because of the less receiving blood to the ventricles. In the beginning of heart rate increase also cardiac output will increase. This increase of both stroke volume and cardiac output will be done until 120 bmp. After higher heart rate cardiac output will remain stable because of the less filling time in the ventricles. This happens until the 160 bmp of heart rate increase. Then if heart rate will have an increase of more than 160 bmp cardiac output will start to decrease. This is important for people practicing with aerobic exercises, because they have to know that they have to maintain cardiac output in between 120-160 bmp so they will also maintain the health of their heart. Heart rate, stroke volume and cardiac output when exercising are all related also by the age of the person, and they have to know the target heart rate that they need to have, to be able to receive the maximum benefits from aerobic workout. [10,15]

2.1.14 Cardiovascular centres

Heart rate is controlled by two pairs of cardiovascular centres of the medulla oblongata. The first centre is the cardioaccelerator which is controlled by sympathetic stimulation of the cardioaccelerator nerves, which stimulate the activity and the second centre is the cardioinhibitory which its role is to decrease the heart activity by parasympathetic stimulation if the X cranial nerve, vagus. Both of their stumulations are transmitted by ta complex of nerve fibers which is located near the base of the heart, which is called cardiac plexus. The cardioaccelerator centre also sends more fibers to form the cardiac nerves of both AV and SA nodes, and also some fibers to atriums and venricles. [15]

The neurotransmitter norepinephrine (NE) shortens the repolarization period and speeds up the rate of depolarization and contraction, to result in the increase of heart rate. This neurotransmitter is released thanks to the sympathetic stimulation, and also an important information is that ventricles are more innervated by sympathetic than parasympathetic fibers. Norepinephrine also binds to beta-1 receptors, which are responsible of the increase of heart rate. So in some cases of cardiac problems, that they use as medications beta blockers, they are targeted in these receptors, to block them which will result in slowing heart rate. [9]

The vagus nerve sends branches in both sinoatrial and atrioventricular nodes, and also in both atriums and ventricles, as the sympathetic stimulations do. By the stimulation of the parasympathetic centre is released another neurotransmitter, called acetylocholine. This neurotransmitter function is to open chemical potassium ion channels to slow the rate of depolarization, and extends repolarization, to increase the time that the next depolarization will occur. This has effect in slowing down the heart rate. [9]

2.1.15 Input to the cardiovascular centre

The cardiovascular centre receives inputs, traveling through the cardiac plexus, from proprioceptors, baroreceptors, chemoreceptors and the limbic system. These receptors make this centre to be able to control precisely the function of the heart, by the cardiac reflexes, so when exercising this centre will suppress the parasympathetic stimulation and increase the sympathetic stimulation to increase the blood flow. So this centre is monitoring each situation and suppresses either parasympathetic or sympathetic stimulation according to each situation. Another mechanism that consists is called baroreceptor reflex, which is responsible to maintain cardiac homeostasis, and is working in opposite direction than the cardiac reflex does, by suppressing the sympathetic system and increasing the parasympathetic. Chemoreceptors are innervated by glossopharyngeal and vagus nerves, and its function is to provide feedback to the cardiovascular centres, by detecting some products which are increasing activity, such as hydrogen ions, carbon dioxide, lactic acid, or by detecting low levels of oxygen, so this centre will be able either to increase or decrease blood flow, according to each situation. Limbic system also has an important effect in heart rate, when is affected by an emotional state such as stress and during this situation, cortisol which is a stress hormone is released and causes an increase in heart rate. So that’s why is important that

the cardiovascular centre gets information also from limbic system, to be able to control situations of stress. [10]

2.1.16 Caffeine and Nicotine

Naturally in the body caffeine and nicotine doesn't exist. Both of these drugs are related with increase of heart rate, because they both have an excitatory effect on membranes of neurons that are causing stimulation of the cardiac centres. More precisely, nicotine stimulates the activity of sympathetic neurons that deliver impulses to the heart, and caffeine increase depolarization of sinoatrial node. [16]

2.1.17 Thyroid hormones

Increased levels of these hormones increase also cardiac rate and contractility. Thyroid hormones, triiodotheronine, enter cardiomyocytes and they change genomes. Also this hormone impacts the beta adrenergic response which increases the rate of depolarization and shortens the repolarization period, which can lead to arrhythmias, but also high levels of thyroxin may cause tachycardia. [1]

2.2 Biomechanics of the heart

2.2.1 Fluid mechanics of the Heart

To analyse the motion of the heart and the connection if the heart with the lings and aorta we must first understand the fluid mechanics of blood flow. Every hour the human heart pumps about 300 L of blood and if the body is under threatening, blood flow can increase to 1200 L – 1500 L. Atria and ventricles are separated by atrioventricular valves. The right valve is called tricuspid, because it consists of three flaps and the left mitral or biscupidal valve consists of two flaps. This flaps ensure that the blood will flow between heart beats, and prevents backflow when ventricles contract. The whole cycle of the heart can be divided to the filling phase (diastole), contraction phase (systole), expulsion phase (systole) and relaxation phase (diastole). During relaxation phase pressure in left atrium is slightly higher than the left ventricle, so the mitral valve is open and blood flows from pulmonary veins first to the left atrium, but because mitral valve remains open, blood is served to the left ventricle. As the filling volume increases, pressure in the left ventricle increases. When the ventricle contraction will occur pressure in the ventricle reach higher levels than the left atrium, so the biscupidal valve will close. When the valve will close, ventricle contracts to maintain blood volume, and this makes the ventricle reach higher pressure than the

arteries, which are decreasing pressure, and this leads the aortal valve to open, and blood flow is served into the aorta. As the blood flows through the aorta, arterial pressure is increasing again and ventricle pressure starts to decrease. After ventricle relaxation will occur, the pressure will be again less than the pressure in the arteries, so aortal and pulmonary valves are closed. Then the first phase of diastole starts again when ventricle pressure will reach lower levels than atrium and filling phase will occur again. [4,22]

2.2.2 Blood rheology

Rheology is the scientific field that deals with the flow and the relative displacement of material points within the body. Blood rheology or hemorheology deals with the flow and deformation of blood and its formed elements. Blood can be thought as a two phase liquid. It can be either considered as a solid-liquid when including the cellular elements, or as a liquid-liquid when referring to the red blood cells under shear. Proper tissue perfusion occurs only when blood rheological properties are met. Blood viscosity is defined as the measure of the resistance of blood to flow. It depends on the protein concentration in the plasma, the ability of the blood cells to deform, and the tendency of the cells of the blood to aggregate. Blood viscosity changes according to the shear strain rate of the flow. It decreases when shear strain increases, and vice versa. It increases when the haematocrit increases, and when temperature decreases. So as we understand, blood cannot be considered as a Newtonian suspension, because it cannot be described by a single value of viscosity. [18,22]

Viscoelasticity of the blood is a property caused by the elastic energy which is stored mainly in the red blood cells, as the heart pumps. Thanks to the high volume of the red blood cells in the blood, elastic properties exist. Viscoelasticity has two components. The first component is viscosity, which is mentioned and defined above, and the second is elasticity which is related to the energy in the blood cells, more precisely the red blood cells. [18]

2.2.3 Pressure and Flow of the blood

Gases and liquids are materials that move from regions which are higher in pressure to regions which have lower pressure. Therefore, blood returning to the heart by the veins, will eventually flow into the atrium because veins have greater pressure than the atrium will have during its relaxed phase. Then the pressure in the atrium will rise up, and this will make the blood to flow to the ventricle. Then ventricular systole

will occur and will increase the pressure in the ventricles so the blood will flow to the pulmonary trunk or to aorta. [18]

2.3 Acute myocardial infraction:

Acute myocardial infarction (AMI), also known as heart attack, is the most severe form of acute coronary syndrome. [3]

2.3.1 Etiology and etiopathogenesis of myocardial infraction

Myocardial infraction is the acute focal ischemic necrosis of the heart muscle resulting interruption of blood flow of coronary artery to the area concerned. Acute myocardial infraction is a complication of advanced atherosclerotic coronary artery disease. Its main cause is approximately 95% closure of a coronary artery thrombus annealing in the plate. Other causes are rare and include the embolism into the coronary artery, coronary artery spasm, injury and inflammation of the coronary artery. Between most important factors determining the ultimate extent of myocardial include: lumen of the artery at the site of the closure, state collateral circulation, spasm of the coronary arteries, the speed of closure of cardiac function, high levels of catecholamines. [3]

2.3.2 Signs and Symptoms

Typical Acute myocardial infraction most of the times occurs suddenly without warning, even though they may experience some symptoms the previous days, before its onset. These symptoms include fatigue, chest discomfort and malaise. After the episode will occur there are some characteristics which will indicate that the patient had an acute myocardial infraction episode. These characteristics include prolonged intense chest pain for half to one hour, heart rate will increase, his pulse might be irregular, and his blood pressure will be elevated. [3]

2.3.3 Diagnosis

The best way to diagnose acute myocardial infraction is by electrocardiography. It’s the most important and precise tool for diagnosing an acute coronary syndrome. [3]

2.4 Hypoxic-ischemic encephalopathy

Hypoxic-ischemic encephalopathy or post hypoxic encephalopathy is a brain injury due to lack or absence of blood flow, oxygen and nutrients. The most common clinical presentations include disorders of consciousness (coma), seizures and myoclonus. [20]

2.4.1 Epidemiology and Pathophysiology

The most common cause of post hypoxic encephalopathy is cardiac arrest, which is secondary caused by infraction or arrhythmia. Other causes include respiratory, neurological and metabolic conditions, trauma and intoxication. These various causes of hypoxic-ischemic encephalopathy have the same pathophysiologic mechanism in which this brain injury is a cause of lack of oxygen and glucose supply. [20]

2.5 Spasticity

Spasticity is the one of the two forms which is known as hypertonia, the second form is called rigidity, and is most often refers to damage to an upper motor neuron in CNS. Spasticity is defined as an increase in a tonic stretch reflex which is dependent on the speed of passive movement. It is associated with increased tendon reflexes, which is the cause of the hyper excitability due to the stretch reflex. It is velocity dependent, and that means that as faster as you try to stretch the more the muscle will resist back. [2,3]

2.5.1 Signs and Symptoms

There are a lot of signs and symptoms referring to spasticity. The first sign which is also mentioned above is increased reflexes. Also increase muscle tone occurs, which sometimes is accompanied with involuntary movements. Another sign is pain. This signs are causing secondary problems to the patients suffering from spasticity, because it decreases the functional ability of the patient and changes the motor development by slowing it down. Abnormal posture and gait are also occurring and all this signs and symptoms cause a general difficulty in taking care and hygiene of the patients suffering. [2]

In people suffering from spasticity we can find some standard types of spasticity, and some muscle groups which are mainly involved. In upper extremities patients have spasticity I adductors of the upper arm which leads in stiffness and pain, spasticity of the flexors of the elbow, spasticity on muscle groups related in pronation of the forearm, spasticity of the wrist flexors, and even more spasticity of the flexors of the metacarpophalangeal and extensors of the proximal phalanges of the fingers. In lower extremities spasticity of the lower leg muscles occurs that leads to secondary diseases such as pes equinovarus or valgus, spasticity also in extensor hallucis longus, spasticity on the extensors or flexors of the knee, and moreover spasticity on the adductors and flexors of the hip. [2]

2.5.2 Assessment of Spasticity

For the assessment of spasticity there are a lot of different scales that evaluate the muscle tone deficit or the extent of spasticity. In my bachelor thesis I choose the modified Ashworth Scale which is also according to Pavel Kolar more specific than the normal Ashworth scale. [2,8]

2.5.3 Physiotherapy

For the treatment of spasticity Physical therapists are having an important role, with the cooperation of the doctors, the speech, the occupational and the recreational therapists. Physical therapist role or goal in the treatment of spasticity is to reduce the muscle tone, to maintain or improve if it's possible the range of motion, to increase or maintain the strength of the patient muscles, to increase coordination, to improve the overall posture and gait and to promote as more as possible self-independence of the patient. Breathing exercises are important because sometimes the patient's pattern of breathing is affected by spasticity. Proper positioning is extremely important in the management of spasticity because it prevents increase in spasticity, decrease in range of motion, contractures and pain. Prolonged stretching is most of the times the most important, or the basis of the rehabilitation of the patient with spasticity, because it helps to prevent contractures but even maintaining or improving the range of motion. In the same point of view, Proprioceptive Neuromuscular Facilitation (PNF) is also beneficial because its techniques are targeting in the same goals such as prolonged stretching does. Strengthening exercises are also beneficial if their aim is to maintain or improve the overall strength of the patient, and they are most often performed after prolonged stretching or PNF techniques in order to have the biggest potential from the affected muscles. Sensorimotor training can also be used as treatment, if patient's stability is affected, to improve proprioception by the help of physiotherapeutic equipment such as soft mads, overballs, etc. Some other modalities that I didn't choose for my physiotherapy treatment but have shown to be beneficial in some studies, is the application of cold, to inhibit the monosynaptic stretch reflex or even sometimes to decrease the pain, for short period of time. Another modality which is also used is heat by different ways such as ultrasound, paraffin, whirpool, etc. Why heat is also used, is because it heats the tissues, and increases the elasticity of them so this may assist in the following stretching activities but it also has effects for short period of time.

The role of physiotherapist is also important after patient's discharge, re-education of the family members and care givers on how to manage spasticity and prevent complications. Special positioning during the night is very helpful to minimize the morning stiffness and pain symptoms. Self therapy and exercise program based on individuals to maintain the physical fitness in optimal levels and prevent abnormalities. Home improvements, modification and repairs are milestone in prevention of accidents and maintaining of independence.

Various authors and respectful methods such as Bobath and Vojta provide very important information and cost-effective solutions.

3. Special Part (Case Study)

3.1 Methodology:

The clinical work practice was done in Kladno hospital, Kladno. It started on Monday 18th of January 2016 and finished on Friday 29th of January 2016 (10 days of practice). Each day had duration of 8 hours. The total amount of hours of practice was 80 hours.

My clinical work placement was supervised by BSc Tomas Modlinger. The number of the sessions with my patient was eight.

The therapeutic procedures were applied in an individual therapy and exercise room. The therapy I used was mostly manual therapy. However, I also used. For the examination I also used instruments such as goniometer, neurological hammer and plumb line.

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

3.2 Anamnesis:

Gender of the examined person: Female

Initials of the examined person: S.K.

Year of birth: 1973, 43 years old

Diagnosis: Anterior ST-segment elevation myocardial infraction

Medical Code: I21.0

3.2.1 Status Presents:

The patient was first hospitalized on 12/10/2015 after her heart attack episode. Later on she was in unconscious phase for 1 month and a week, and after she woke up she was moved to Kladno hospital and started rehabilitation program. The patient 2 months after waking up, on 19 of January, was in very good mood, she was able to stand, and was preparing her coffee when I entered her room. My supervisor also informed me that she was also diagnosed with Organic Psychosyndrome, which onset was after her heart attack episode. So her situation, because of the unconscious period that made her not able to remember how exactly things happened but also her syndrome caused by her heart attack episode, was making my ability to communicate and get all the information about her patient more difficult. Her main complaint was that whole her body but more her upper body was affected by spasticity and her posture was changed with main muscle groups being affected such as her flexors of her shoulder, extensors of her elbows, etc.

Height: 178 cm, Weight: 77 kg, BMI: 24.3, Blood pressure: 138/87, Heart pulse: 74

3.2.2 History Anamnesis:

The patient on 12/10/2015 woke up, ate her breakfast and she suddenly started feeling uncomfortable, had difficulties to breath and then she had a heart attack. Her family called the emergency, it took them 15 minutes to arrive to her place and when the emergency arrived she was having resuscitation for 45 minutes. Due to the emergency of the situation she was moved by helicopter to a hospital in Prague. She had a surgery for revascularization.. Because of her situation on 19/10/2015 felt unconscious. She was unconscious for 1 month and a week, and when she woke up she was moved in Kladno hospital, and then she started to remember things. Patient followed a program for rehabilitation after waking up from her unconscious stage in order to start recovering and for her to be able to make ADL activities.

3.2.3 Family anamnesis:

Patient mentioned that her father had a heart attack when he was 50 years old

3.2.4 Social anamnesis:

She is married, and she has one son, living in a flat at the ground floor.

3.2.5 Occupational anamnesis:

She use to work as a cooker in a school kitchen

3.2.6 Medical Anamnesis:

She was also diagnosed with post hypoxic encephalopathy, essential primary hypertension and vertebroalgic syndrome

3.2.7 Operation Anamnesis:

-

3.2.8 Pharmacological anamnesis:

Patient used to take Euthyrox because of hypothyroidism, Clexane and Dipidolor, and aspirins for pain relief. She was using also beta-blockers for decreasing her high blood pressure.

3.2.9 Previous rehabilitation:

Before falling in coma, she had barotherapy for 1 week because of the posthypoxic encephalopathy. After waking up from her unconscious stage she was having a rehabilitation program following respiratory physiotherapy (breathing exercises and oxygen therapy with the use of hyperbaric chamber), lymphatic therapy, thromboembolic prevention by doing conditional training, stationary bicycle for her Lower extremities, motor splint for the upper extremities for improving flexion and abduction of the shoulder, posture and gait reeducation until the time I visited her. Also one day before I visit her, she started physiotherapy program of hyperbaric oxygen chamber for two weeks, to increase the amount of oxygen in the blood.

3.2.10 Excerpt from patient's health care file:

Patient had Electrocardiography after arriving to the hospital which showed up that my patient had an ST-segment elevation myocardial infarction and doctor indicated a surgery for revascularization.

3.2.11 Indication for rehabilitation:

Doctor indicated physiotherapeutic courses that will be concentrated on breathing exercises, conditioning exercises for preventing thromboembolism and for improving her overall condition, and then verticalization with the patient, as a first phase of rehabilitation. The doctor later on indicated posture, gait reeducation, and stretching exercises, and ROM improving exercises, for treating spasticity.

3.2.12 Subjective feeling of the patient:

She is not feeling pain anywhere at all, when standing on ideal posture, but as she mentioned she is feeling pain on both shoulders when doing overhead movements, and her pain is more on her left side.

3.2.13 Previous Injuries and Trauma:

-

3.2.14 Allergies:

-

3.2.15 Abuses:

She smokes 1 packet of cigarretes per day, drinking 2 cups of coffee and doesn't drink alcohol.

3.2.16 Differential balance:

My hypothesis for the patient who had ST-segment elevation myocardial infarction is that spasticity will be her main complain that will affect her gait and her posture. Due to the spasticity I expect also to find some hypertonic muscles all over her body, in her back, Upper and Lower extremities. Moreover I expect some muscle strength imbalances in both Upper and Lower extremities because of her long time inactivity, because of the period when she was unconscious. This inactivity may also cause some muscle shortness. Some joints also may be affected and we can find some restriction in joint play. Finishing, I also expect to find some problems referring her fine motor skills.

3.3 Initial Kinesiologic Examination:

- Observation
- Postural Examination
- Gait examination
- Breathing examination
- Muscle tone examination (palpation)
- Muscle length test by Janda or Kendall
- ROM examination by Kendall
- Joint play examination by Lewit
- Neurological examinations and special tests

3.3.1 Observation

- Patient was able to stand but she was unstable after the first seconds of standing
- Both of her elbows were in semi flexed position
- Both of her shoulder girdles were elevated

3.3.2 Postural examination

Posterior view:

- Base of support was smaller
- Left feet slightly in internal rotation
- Same shape and size of both ankles
- Popliteal fossas of left side was slightly higher
- Subgluteal line of left side was slightly higher
- Iliac spines were seem in the same level
- Normal shape of the spine
- Elbows in semi flexed position, and thoracolumbar triangles were different in shape with left one being smaller
- Left scapula was higher than the right
- Left shoulder girdle was slightly higher
- Head was slightly titled towards the left side

Lateral view from the right side:

- Ankles on the same level
- Knees on the same level
- Lumbar spine is flat
- Thoracic and cervical spines were normal in shape
- Left shoulder was seen higher than the right
- Elbows were semi flexed with left forearm being higher than the right

Lateral view from the left side:

- Ankles on the same level
- Knees on the same level
- Lumbar spine is flat
- Thoracic and cervical spines were normal in shape
- Left shoulder was seen higher than the right
- Elbows were semi flexed with left forearm being higher than the right

Anterior view:

- Feet are not flat, and they are symmetrical but left feet is slightly internal rotated
- Ankles are same in shape and symmetrical
- Knees are symmetrical, but left knee was slightly higher
- Elbows in semi flexed position, and thoracolumbar triangles were different in shape with left one being smaller
- Chest and abdomen were symmetrical
- Both shoulder girdles are elevated with the left one slightly higher
- Head was slightly tilted to the left side

I) Single leg stance: She was able to perform it on right side, but in left side she was losing her balance

II) Two scale test: Right side: 41 kg Left side: 36 kg so it was normal because results didn't exceed the 10% of difference

- Dynamic Spine Examination:

- Flexion: During flexion I observed normal movement in the thoracic region, lumbar area was flat, and the spines in cervical spine were prominent and also the movement in cervical area was small
- Extension: During extension I wasn't able to observe a lot because my patient was not able to perform the test with her hands on her buttocks because it was painful for her as she mentioned, but I saw her lumbar spine flattening and again small movement in cervical area
- Lateral flexion to the right: During lateral flexion to the right her pelvis started moving towards the other side so early, so we stopped the test movement there and we observed that again most of the movement was in thoracic spine but in cervical and lumbar spine it was just a small movement
- Lateral flexion to the left: During lateral flexion to the left her pelvis also started to move to the other side, but comparing to the lateral flexion to the right, she was able to bend more to the left, but still with almost no movement in cervical, normal movement in thoracic and small movement in lumbar area

- Romberg test: patient was able to stand with normal base of support, when standing with feet together she was losing her balance after short period of time, and when standing with feet together and closed eyes she was immediately losing her balance.
- Trendelenburg sign: When standing on right side she was able to maintain the position of her pelvis but there was lateroflexion of the body towards the right side, and when standing on her left side she was not able to keep the position more than 2-3 seconds.

3.3.3 Gait Examination

- Walking rhythm was periodic when she started walking but then suddenly after walking the first steps she started not being periodic and she was walking with her right UE and right LE the same time instead of using her one side's UE and contralateral side's LE
- Walking speed was slow
- Stride length was short
- Movement of the foot was good, she was first touching the floor with heel strike, then physiological proceeding to flat foot, loading response and heel-off phase but toe-off phase was absent in both feet

- Position and movement of the pelvis was okay with the lateral tilt of the pelvis not exceeding 4cm
- There was higher activity on the back muscles which was obvious
- Movement of her Upper extremities was absent in left side and in right side there was some movement but steel not enough
- Head during walking was slightly tilted to the left
- Stability of walking wasn't good, because some steps were making her losing her balance, that's why I think also she was walking slower than normal

3.3.4 Breathing Examination

My patient was lying in supine position during examining her breathing

- Patient wasn't using her lower abdominal muscles to breath but only thoracic part and mainly her lower thoracic
- Movement of the ribs was good and in general the movement of the thoracic part was less than normal especially in upper thoracic region.

3.3.5 Fascia examination

Examination of fascia on chest: Restricted fascia on upper thoracic region in lateral and medial direction. No restriction when examining lower thoracic. I also examined upper extremities on medial and lateral direction but there was no restriction on both sides, also I examined thoracolumbar region in cranial and caudal direction and there was some restriction when examining caudal direction on both sides.

3.3.6 Muscle tone Examination (According to Lewit)

Tested Muscle	Left	Right
Pectoralis major	Hypertonic+	Hypertonic+
Supraspinatus	Hypertonic+	Hypertonic+
Infraspinatus	Hypertonic+	Hypertonic+
Deltoid anterior	Hypertonic+	Hypertonic+
Deltoid middle	Hypertonic+	Hypertonic+
Deltoid posterior	Hypertonic+	Hypertonic+
Terres minor	Hypertonic+	Hypertonic+
Biceps brachii	Hypertonic+	Hypertonic+
Triceps brachii	Hypertonic	Hypertonic

Latissimus dorsi	Normal tone	Normal tone
Upper part of trapezius	Hypertonic+	Hypertonic
Serratus anterior	Normal tone	Normal tone
Iliopsoas	Hypertonic	Normal tone
Gluteus maximus	Hypertonic	Hypertonic
Tensor fascia latae	Hypertonic	Hypertonic
Quadriceps femoris (rectus femoris, vastus medialis, intermedius, lateralis)	Hypertonic	Normal tone
Semitendinosus	Hypertonic	Normal tone
Semimembranosus	Hypertonic	Normal tone
Biceps femoris	Hypertonic	Normal tone
Gastrocnemius	Hypertonic	Hypertonic

Table No. 1 – Initial Kinesiologic Examination - Muscle tone examination

3.3.7 Muscle length test

Examined muscle	Left	Right
Gastrocmemius (According Kendall)	Shortness	Shortness
Soleus (According Kendall)	Shortness	Normal
Hamstrings (According Kendall)	Normal	Normal
Hip flexors (According Kendall)	Normal	Normal
Pectoralis major (According Kendall)	Shortness	Shortness
Pectoralis minor (According Kendall)	Shortness	Shortness
Teres major, latissimus dorsi, rhomboids (According Kendall)	Shortness	Shortness
Medial shoulder rotators (According Kendall)	Shortness	Shortness
Lateral shoulder rotators (According Kendall)	Shortness	Shortness
Trapezius (According Janda)	Grade 2	Grade 1
Levator scapulae (According Janda)	Grade 2	Grade 1

Table No. 2 – Initial Kinesiologic Examination - Muscle length test according to Kendall and Janda

3.3.8 ROM Examination by Kendall

SHOULDER JOINT				
Plane	**Left**		**Right**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	10-0-90	15-0-100	20-0-110	20-0-110
F	90-0-0	90-0-0	110-0-0	115-0-0
R	10-0-80	15-0-85	55-0-90	60-0-90

ELBOW JOINT				
Plane	**Left**		**Right**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	-10-0-90	-10-0-110	-5-0-120	0-0-125
RADIOULNAR JOINT				
Plane	**Left**		**Right**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
R_s	80-0-60	85-0-60	80-0-80	80-0-80

HIP JOINT				
Plane	**Left side**		**Right side**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	10-0-90	20-0-120	10-0-100	25-0-130
F	25-0-20	30-0-20	25-0-20	30-0-20
R	30-0-20	35-0-25	40-0-25	45-0-25

KNEE JOINT				
Plane	**Left side**		**Right side**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	0-0-100	0-0-130	0-0-100	0-0-130
ANKLE JOINT				
Plane	**Left side**		**Right side**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	5-0-60	10-0-65	5-0-60	10-0-65
R	20-0-20	20-0-20	20-0-20	20-0-20

Table No. 3 – Initial Kinesiologic Examination - Range of motion examination of shoulder joint, elbow joint, radioulnar joint, hip joint, knee joint and ankle joint

3.3.9 Joint play examination according to Lewit

Joint	Left	Right
Springing of shoulder joint in caudal direction with hand in 90 abduction	Not Restricted	Not Restricted
Acromioclavicular joint (ventrodorsal and craniocaudal)	Not Restricted	Not Restricted
Springing of elbow (radial and ulnar direction)	Restricted	Restricted
Dorsal shifting of the proximal row of carpal bones relative to the radius.	Not Restricted	Not Restricted

Palmar shifting of the distal row of carpal bones relative to the proximal row.	Not Restricted	Not Restricted
Metatarsophalangeal joints in palmar, dorsal and lateral directions	Not Restricted	Not Restricted
Interphalangeal joints in palmar, dorsal and lateral directions	Not Restricted	Not Restricted
Patella (medial, lateral, cranial and caudal directions)	Not Restricted	Not Restricted
Tibiofibular joint in dorsal and ventral directions	Not Restricted	Not Restricted
Talocrural joint in dorsal and ventral directions	Restricted	Not Restricted
Lisfranc's joint in dorsal and ventral directions	Restricted	Not Restricted
Chopart's joint in dorsal and ventral directions	Not Restricted	Not Restricted
Metatarsophalangeal joints in plantar, dorsal and lateral directions	Not Restricted	Not Restricted
Interphalangeal joints in plantar, dorsal and lateral directions	Not Restricted	Not Restricted
Ribs in ventral and dorsal direction	Restriction found in ventral direction of 3rd rib	Not Restricted

Table No.4 – Initial Kinesiologic Examination - Joint play examination according to Lewit

3.3.10 Neurological Examinations and special tests

Test	Left Side	Right Side
Babinsky sign	Positive (dorsal flexion of hallux)	Positive (dorsal flexion of hallux)
Chaddock's sign	Positive (dorsal flexion of hallux)	Positive (dorsal flexion of hallux)
Mingazzini test (lower extremities)	Positive because when testing, her right UE was falling down	
Mingazzini test (lower extremities)	Positive because when testing, her left LE was falling down	
Barre sing	Negative	

Table No. 5 – Initial Kinesiologic Examination - Neurological Examinations

Deep Tendon Reflexes (Grading According to Vele)		
	Left	Right
Biceps reflex	3	3
Triceps reflex	4	3
Brachioradialis reflex	3	3
Knee reflex	4	3
Achilles tendon reflex	3	3

Table No. 6 – Initial Kinesiologic Examination - Deep tendon reflexes according to Vele

*Evaluation grades, according to Vele, where grade 3 is considered as normal response of reflex and grade 4 hyper reflexive responses.

We also examined her ability to grip, and she was able to do it in both sides, opposition, and she was able to do it in both sides, and moreover we ask her to try to touch her nose with her hand, and she was able to do it only with maximal flexion of the cervical spine during examining right side but the movement of the right UE was slow and her hand was shaking, and when examining the right side she was able to touch her nose without flexing her cervical spine.

I also evaluated her spasticity in both Upper and Lower Extremities, by following Modified Ashworth Scale which evaluates the resistance when passively trying to move the part of the body, where its grading varies from 0-4 (0: no increase in muscle tone, 1: slight increase in muscle tone, 2: more marked increased in muscle tone, 3: considerable increase in muscle tone and passive movement is difficulty performed, 4: part is rigid in flexion or extension)

Modified Ashworth Scale		
	Right side	Left side
Wrist	0	1
Elbow	1	1
Shoulder	2	3
Hip	0	1
Knee	0	1
Ankle	1	1

Table No. 7 – Initial Kinesiologic Examination - Modified Ashworth Scale

3.3.11 Conclusion of examination:

Concluding from all those examinations, patient main problem is spasticity. Two months after waking up from her unconscious phase, she still faces a lot of problems that need more time to be restored back in normal, but anyway according to her diagnosis, and the complications that she had after her heart attack episode, my supervisor informed me that in general she had a good progression since the time I visit her, and she was able to perform her ADL activities without any further complication. The only task that makes her feel pain as she mentioned is overhead activities with her UEE. During observing her standing and her posture main complication was that she wasn't stable enough, maybe because of some muscle weakness, and we also observed this during examining Romberg test and Trendeleburg sign. Walking is also affected because of her instability, so she is walking in low rhythm and slower steps because this is making her feel more stable. Also because of the spasticity, movement in her UEE, especially in her left UE was forbidden. During examining muscle tone as we expected we found out a lot of muscle being hypertonic, caused of course from the spasticity. Moreover, some muscles were also influenced in their length, with the main complications found in her right UE. Her ROM is also limited in both upper and lower

extremities. Movements of flexion, abduction and external rotation were the most limited, when referring shoulder, and also both of her both elbows were limited in both flexion and extension. ROM was also limited in LE with the main restriction being in left side hip and also in both sides dorsal flexion. During Joint play examination, we found no restriction in upper extremities except her elbows in both sides that were restricted in both ulnar and radial direction so that's why maybe her elbows were both semiflexed when observing her. Neurological tests of Babinsky, Chaddock, Migazzini (upper and lower extremities) were positive, so they were indicating us problem in pyramidal system, and also there was some hypereflexia during examining deep tendon reflexes also caused from spasticity. So conluding from all my examinations, her main complaint that affects a lot of functions of her muscles is spasticity, so I also used Modified Ashworth scale to access her spasticity, and also for making me able to find out in which joints and muscles groups spasticity was more obvious, for a better orientation before starting the therapy with her.

3.4 Short-term and long-term rehabilitation plan

3.4.1 Short-term rehabilitation plan

- Mobilization of the restricted joints
- Increase ROM in all restricted joints of upper and lower extremities
- Relax hypertonic muscles
- Stretch shortened muscles
- Strengthen weak miscles
- Improve posture
- Improve gait
- Improve stability
- Decrease spasticity
- Improve breathing pattern
- Exercise balance and proprioception

3.4.2 Long-term rehabilitation plan

- Regain maximum possible ROM in all restricted joints in both upper and lower extremities
- Improve confidence and restore normal gait pattern
- Restore normal length of shortened muscles
- Regain normal strength of weakened muscles

3.5 Therapy progress

Date: Tuesday 19/01/2016

Today's present state:

- Today is my first physiotherapeutic session and she is after 2 months of waking up from her unconscious phase.
- The patient feels tired, because of the long time that we spend to perform all the examinations, so our first session will not last for long time.

Goal of today's therapy:

- Increase ROM in both lower and upper extremities
- Reduce spasticity
- Improve muscle length
- Improve Joint Play in restricted joints
- Improve cooperation and communication skills

Procedure:

- I started my first therapy by increasing ROM. I asked the patient to lie on the bed in supine position. Firstly I ask her to perform active flexion, abduction, internal and external rotation of her shoulders, first on left side and then on right side. Then when she finish, we ask her to perform flexion and extension of both her elbows. Then I ask her to dorsi flex and palmar flex her wrist of both sides and also to radial and ulnar duct them.
- After finishing, we proceed to lower extremities. I started by asking her to flex her hips, then adduct, abduct, internal rotate and external rotate them. Then we proceed in ankle movements in dorsal and plantar flexion and also inversion and eversion. When she finished from all this movements I asked her to lie in prone position and to active move shoulder extension, hip extension and knee flexion in both sides.

  *(All these active movements where performed 10 times for 3 sets)
- Afterwards, we continued with the mobilization of her left talocrural and Lisfranc joint in both ventral and dorsal direction (with flexed knee when doing mobilization of talocrural in supine position, and with extended knee in supine position when doing mobilization on Lisfranc joint) . Then we proceeded in joint play mobilization of both

elbows in ulnar and radial direction, with her being seated in the edge of the table, in correct posture, and her feet touching the floor.

- In the end, I ask her to lie again on the bed in supine position, and we tried to stretch her both shoulders in flexion and external rotation by prolonged stretching for 2 minutes for each movement on each joint. (during performing prolonged stretching in shoulder flexion and external rotation my patient was complaining that she was feeling pain in level 6/10)

Results:

Patient after we finished prolonged stretching therapy, she told us that she was exhausted and she didn't want to continue the therapy, so I respected it and let her go.

Self-therapy:

For self-therapy I just recommended her to provide 3 more sets of 10 times of all active movements that she performed during our first physiotherapy session.

Date: Thursday 21/01/2016

Today's present state:

- Today is my second physiotherapeutic session
- We didn't perform any therapy yesterday 20/01/2016 because my patient went to hyperbaric oxygen chamber, and then she had to be controlled by the doctors and ergo therapist to see her progression, and doctors indicated not to perform her any therapy.
- The patient today is in a good mood, she just finished her therapy of hyperbaric oxygen chamber, and she asked me to have a break of ten minutes, she prepared her coffee, drunk it and then she came to the physiotherapy room to start our session.

Goal of today's therapy:

- Release restricted fascia
- Improve breathing stereotype
- Increase ROM in both lower and upper extremities
- Reduce spasticity
- Improve joint play on restricted joints
- Improve muscle length
- Improve stability
- Correct gait

Procedure:

- For improving breathing stereotype, I started first by trying to release fascia on both direction by taking slack of the restricted region of upper thorax in medial direction and then in lateral direction of both sides, in supine lying position. Then we were practicing focusing on the abdominal breathing, by first just firmly movements along her abdomen from sides to the middle, and then I placed my both hands on her abdomen and I asked her to focus on breathing only under my hands. In the beginning it was difficult for her to perform it, but after several times of breathing she was able to do it. Then I proceed to the same exercise in the other two segments (lower thoracic and upper thoracic) for 3 minutes on each segment. In the end I also performed stretching of fascia in lumbar area in caudal direction.
- For increasing ROM, i asked the patient to perform the same exercises that she performed in our first physiotherapeutic session. So she lay on the bed in supine position. She performed actively flexion, abduction, internal and external rotation of her shoulders, on both sides, then she flex both of her elbows, then I ask her to dorsi flex and palmar flex her wrist of both sides and also to radial and ulnar duct them.
  (All these active movement where performed 10 times for 3 sets)
- After finishing, she proceed to lower extremities and started by flex her hips, then adduct, abduct, internal rotate and external rotate them, then she proceeded in ankle movements in dorsal and plantar flexion and also inversion and eversion. When she finished from all this movements I asked her to lie in prone position and to active move shoulder extension, hip extension and knee flexion in both sides.
  (All these active movement where performed 10 times for 3 sets)
- Afterwards, we examined joint play of restricted joints, and they were still restricted so we continued with the mobilization of them. First with the left talocrural and Lisfranc joint in both ventral and dorsal direction (with flexed knee when doing mobilization of talocrural in supine position, and with extended knee in supine position when doing mobilization on Lisfranc joint) . Then i proceeded in joint play mobilization of both elbows in ulnar and radial direction, with her being seated in the edge of the table, in correct posture, and her feet touching the floor. I also perform mobilization of 3rd rib on left side in ventral direction, and then not specific mobilization of ribs in exhalation by vibration.

- Then I proceeded again in prolonged stretching. I started from stretching upper trapezius muscle in supine lying position on both sides and then on upper extremities, and I stretch both shoulders in all possible movements for 1 minute (flexion, extension, abduction, external and internal rotation), then both elbows (flexion,extension), then both radiocarpal joint (pronation, supination), then both wrists (dorsal flexion, palmar flexion, radial duction and ulnar duction). After stretching all the joints of UE for 1 minute, i performed stretching on LE. I started again by both hips (flexion, extension, abduction, adduction, internal and external rotation), then both knees (flexion, extension), and in ankles (dorsal flexion, plantar flexion, inversion and eversion) for 1 minute on each joint. Patient during prolonged stretching she mentioned that she was feeling pain, in level 5/10 when stretching shoulder in flexion in left side, and 3/10 when stretching the right, pain 6/10 when stretching external rotation of the left shoulder and 4/10 when stretching right side, and also pain during elbow flexion on both sides on level 3/10, and pain in elbow extension of both sides on level 4/10.
- Then I lowered the level of the bed so my patient could touch the floor by her feet when sitting on the edge of the table. I asked my patient to sit in correct posture and I educated her about the three points on each feet of her that she has to be focused when walking. (Base of 1^{st} metatarsophalangeal joint, heel, base of 5^{th} metatarsophalangeal joint). After practicing for 5 minutes, we practice the same exercise by using a disc balance cushion, to improve proprioception for 5 more minutes, for both feet. After finishing and this exercise I asked the patient to stand up and practice again the same exercise but in standing position for 5 more minutes, on both feet.
- In the end, I educated my patient how her gait must be, and she was walking under my instructions, along the corridor, and I focused more on toe off phase, by explaining her how her proper walking should be. When walking I noticed that the movement on her upper extremities was slightly improved, but was still not the proper, so I also explained her how her gait should be, and how important is to move her upper extremities.

Results:

Today patient after finishing the therapy wasn't as tired as our first physiotherapy session, but she was still feeling tired. After finishing my second therapy I noticed an improvement on the following:

- Gastrocnemius and Soleus length was improved, because active dorsal flexion of ankles was improved (20°) on both sides.
- Shoulder on left side: Active Flexion: 100, Active Extension: 20, Active abduction: 100, Active internal rotation: 90, Active External Rotation: 15.
- Shoulder on right side: Active Flexion: 120, Active Extension: 25, Active Abduction: 120, Active External Rotation: 60.
- Elbow on left side: Active Extension: -5, Active Flexion: 100
- Elbow on right side: Active Flexion: 125
- Radioulnar joint on left side: Active pronation: 70
- Hip joint on left side: Active extension: 15, Active flexion: 100, Active abduction: 30, Active adduction 25, Active Internal Rotation: 25, Active External Rotation: 35
- Hip joint on right side: Active extension: 15, Active flexion: 110, Active abduction: 30, Active adduction 25, Active Internal Rotation: 30
- Knee on left side: Active flexion: 105
- Knee on right side: Active flexion: 105
- Ankle on left side: Active dorsal flexion: 20
- Ankle on right side: Active dorsal flexion: 20
- Joint play on left ankle was restored back to normal, on Talocrural and Lisfranc joint, and also the joint play of the left 3rd rib.
- I also noticed as I mentioned above that the movement of upper extremities during gait was improved, but still was not in normal levels.

Self-therapy:

For self-therapy I recommended her to provide 3 more sets of 10 times of all active movements that she performed during our first physiotherapy session. Also I told her when walking during the day to focus on the three points that we were practicing, and also to try to use the toe-off phase, and try to control the movement of her hands as well. Also I asked her to practice the same breathing exercises that we did in our session, to try and breathe below her hands, in all the three possible segments (abdominal, lower and upper thoracic)

Date: Friday 22/01/2016

Today's present state:

- Today is my third physiotherapeutic session
- The patient today is again in a good mood, she just finished her therapy of hyperbaric oxygen chamber, and she asked me to have a break of ten minutes, she prepared her coffee, drunk it and then she came to the physiotherapy room to start our session.

Goal of today's therapy:

- Release restricted fascia
- Improve breathing stereotype
- Increase and maintain gained ROM in both lower and upper extremities
- Reduce spasticity
- Improve muscle length
- Improve stability
- Correct gait

Procedure:

- For improving breathing stereotype, I started again first by trying to release fascia on both direction by taking slack of the restricted region of upper thorax in medial direction and then in lateral direction of both sides. Then we continue as yesterday, by focusing on the abdominal breathing, by first just firmly touching along her abdomen from lateral to medial direction, and then I placed my both hands on her abdomen and I asked her to focus on breathing only under my hands. Then I proceed to the same exercise, to breathe under my hands, in the other two segments (lower thoracic and upper thoracic) for 3 minutes on each segment.
- For increasing ROM, i asked the patient to perform the same exercises that she performed in our first and second physiotherapeutic session, but with the difference that today all the active exercises was done active against slight resistance by me. So she lay on the bed in supine position. She performed actively flexion, abduction, internal and external rotation of her shoulders, on both sides, then she flex both of her elbows, then I ask her to dorsi flex and palmar flex her wrist of both sides and also to radial and ulnar duct them. After finishing, she proceed to lower extremities and started by flex her hips, then adduct, abduct, internal rotate and external rotate them, then she proceeded in ankle movements in dorsal and plantar flexion and also inversion and eversion. When she finished from all this movements I asked her to lie in prone position and to active

move shoulder extension, hip extension and knee flexion in both sides. All these active movement where performed 10 times for 3 sets.

- Then I proceeded again in prolonged stretching. I started from stretching upper trapezius muscle in supine lying position on both sides and then on upper extremities, and I stretch both shoulders in all possible movements for 1 minute (flexion, extension, abduction, external and internal rotation), then both elbows (flexion,extension), then both radiocarpal joint (pronation, supination), then both wrists (dorsal flexion, palmar flexion, radial duction and ulnar duction). After stretching all the joints of UE for 1 minute, i performed stretching on LE. I started again by both hips (flexion, extension, abduction, adduction, internal and external rotation), then both knees (flexion, extension), and in ankles (dorsal flexion, plantar flexion, inversion and eversion) for 1 minutes on each joint. Patient during prolonged stretching she mentioned that she was feeling pain, in level 4/10 when stretching shoulder in flexion in left side, and 3/10 when stretching the right, pain 5/10 when stretching external rotation of the left shoulder and 3/10 when stretching right side, and also pain during elbow flexion on both sides on level 2/10, and pain in elbow extension of both sides on level 2/10.
- After finishing, I asked my patient to stand up. We were going to practice by doing sensorimotor training to improve her stability. I asked my patient to try to walk in a soft mad, and I was controlling her, and giving her corrections. Then after 5 minutes that she was walking on the soft mad, she took a break for 1 minute, and then I moved the soft mad close to the Swedish Ladder. I asked her to take a hold from the ladder and to try to flex her left knee first and try to keep her posture, in ideal alignment by standing on one (right) leg, which was slightly flexed, by correcting her. Then we changed sides. When we were practicing standing on left side, and she was losing her balance after 10-20 seconds of standing, and it was more difficult for her to perform it in this side than the other side.
- In the end, we practiced again gait in the corridor. Today her gait was better than yesterday, her shoulders weren't elevated anymore, and the movement of her hands was greater than the first day that I met her. I also noticed that her stability of walking was better, but still the toe-off phase was missing. We continued practicing her gait for 5 minutes, under my instructions.

Results:

Today patient after finishing the therapy wasn't feeling tired. After finishing my third therapy I noticed an improvement on the following:

- Shoulder on left side: Active Flexion: 105, Active Extension: 25, Active abduction: 105, Active External Rotation: 25.
- Shoulder on right side: Active Flexion: 125, Active Extension: 30, Active Abduction: 120, Active External Rotation: 65.
- Elbow on left side: Active Extension: 0, Active Flexion: 125
- Radioulnar joint on left side: Active pronation: 80
- Hip joint on left side: Active extension: 20, Active flexion: 110, Active abduction: 35, Active adduction 25, Active Internal Rotation: 30, Active External Rotation: 40
- Hip joint on right side: Active extension: 20, Active flexion: 115, Active abduction: 35, Active Internal Rotation: 35
- Knee on left side: Active flexion: 115
- Knee on right side: Active flexion: 115
- Shoulders, where not elevated anymore, neither her head was tilted to left side.
- Fascia on upper thoracic part was also released and also breathing was improved, with her being able to breathe in all the three segments (abdomen, lower and upper thoracic)
- I also noticed as I mentioned above that the movement of upper extremities during gait was improved, and her elbows of both sides were able to fully extend.

Self-therapy:

For self-therapy I recommended her to provide 3 more sets of 10 times of all active movements that she performed during our physiotherapy session. Also I told her when walking to try to use the toe-off phase, and try to control the movement of her hands as well. Also I asked her to practice the same breathing exercises that we did in our session, to try and breathe below her hands, in all the three possible segments (abdominal, lower and upper thoracic)

Date: Monday 25/01/2016

Today's present state:

- Today is my fourth physiotherapeutic session
- The patient today is again in a good mood, she just finished her therapy of hyperbaric oxygen chamber, and she asked me to have a break of ten minutes, she prepared her coffee, drunk it and then she came to the physiotherapy room to start our session.

Goal of today's therapy:

- Increase ROM in both lower and upper extremities
- Reduce spasticity
- Improve muscle length
- Improve stability
- Correct gait

Procedure:

- Today, for increasing ROM I used PNF techniques. I used Contract-Relax technique. First I applied the diagonal of 1st flexion of upper extremities and 1st extension of upper extremities on both sides. Then I proceed on 2nd diagonal flexion and 2nd diagonal extension of both sides. Afterwards, we continued by the same technique of Contract-Relax on all possible diagonals of lower extremities (1st flexion diagonal, 1st extension diagonal, 2nd flexion diagonal, 2nd extension diagonal). Then I also applied the same relaxation technique to pelvis and to scapula, on anterior elevation, anterior depression, posterior elevation, and posterior depression.
- Then I used Dynamic Reversals to increase the strength and control the range of motion of the newly gained range of motion. So I applied this strengthening technique in upper extremities (1st diagonal flexion and extension, 2nd diagonal flexion and extension), then in lower extremities (1st diagonal flexion and extension, 2nd diagonal flexion and extension), then I also applied the same strengthening technique to pelvis and to scapula, on anterior elevation, anterior depression, posterior elevation, and posterior depression.
- Then I proceeded again in prolonged stretching. I started from stretching both shoulders in all possible movements for 1 minute (flexion, extension, abduction, external and internal rotation), then both elbows (flexion,extension), then both radiocarpal joint (pronation, supination), then both wrists (dorsal flexion, palmar flexion, radial duction and ulnar duction). After stretching all the joints of UE for 1 minute, i performed

stretching on LE. I started again by both hips (flexion, extension, abduction, adduction, internal and external rotation), then both knees (flexion, extension), and in ankles (dorsal flexion, plantar flexion, inversion and eversion) for 1 minute on each joint. Patient during prolonged stretching she mentioned that she was feeling pain, in level 2/10 when stretching shoulder in flexion in left side, and 1/10 when stretching the right, pain 2/10 when stretching external rotation of the left shoulder and 2/10 when stretching right side.

- Then I followed sensorimotor training to improve her stability. I asked my patient to try to walk in a soft mad, and I was controlling her, and giving her instructions. Then after 5 minutes that she was walking normal and backwards on the soft mad, she took a break for 1 minute, and then I moved the soft mad close to the Swedish Ladder. I asked her to take a hold from the ladder and to try to flex her left knee first and try to keep her posture, in ideal alignment by standing on one (right) leg, which was slightly flexed, by correcting her. Then we changed sides. Today, we were emphasized more in left lower extremity which was better than on Friday, and she was able to keep her balance but her whole lower extremity was shaking.
- Then in the end, we practiced again gait in the corridor. Today her gait was better than last therapy session the movement of her hands was greater. I also noticed that her stability of walking was better. We continued practicing her gait for 5 minutes, under my instructions.

Results:

Today patient after finishing the therapy wasn't feeling tired. After finishing my forth therapy I noticed an improvement on the following:

- Shoulder on left side: Active Flexion: 110, Active Extension: 30, Active abduction: 110, Active External Rotation: 30.
- Shoulder on right side: Active Flexion: 130, Active Abduction: 125
- Hip joint on left side: Active flexion: 120, Active Internal Rotation: 35
- Hip joint on right side: Active flexion: 125
- I also noticed as I mentioned above that the movement of upper extremities during gait was improved and she was ideally using both of her upper extremities during walking. Also toe-off phase was improved and I could see that the last contact of her feet was on her toes.

Self-therapy:

For self-therapy I asked her to perform the same exercises that she was doing for self-therapy (Active ROM exercises) by the use of elastic thera-band, of light resistance.

Date: Tuesday 26/01/2016

Today's present state:

- Today is my fifth physiotherapeutic session
- The patient today is again in a good mood, she just finished her therapy of hyperbaric oxygen chamber, and she asked me to have a break of ten minutes, she prepared her coffee, drunk it and then she came to the physiotherapy room to start our session.

Goal of today's therapy:

- Increase ROM in both lower and upper extremities
- Reduce spasticity
- Improve muscle length
- Improve Joint Play in restricted joints
- Improve stability
- Correct gait

Procedure:

- Today, for increasing ROM I used again PNF techniques. I used Contract-Relax technique. First I applied the diagonal of 1^{st} flexion of upper extremities and 1^{st} extension of upper extremities on both sides. Then I proceed on 2^{nd} diagonal flexion and 2^{nd} diagonal extension of both sides. Afterwards, we continued by the same technique of Contract-Relax on all possible diagonals of lower extremities (1^{st} flexion diagonal, 1^{st} extension diagonal, 2^{nd} flexion diagonal, 2^{nd} extension diagonal). Then I also applied the same relaxation technique to pelvis and to scapula, on anterior elevation, anterior depression, posterior elevation, and posterior depression.
- Then I used Dynamic Reversals. So I applied this strengthening technique in upper extremities (1^{st} diagonal flexion and extension, 2^{nd} diagonal flexion and extension), then in lower extremities (1^{st} diagonal flexion and extension, 2^{nd} diagonal flexion and extension), then I also applied the same strengthening technique to pelvis and to

scapula, on anterior elevation, anterior depression, posterior elevation, and posterior depression.

- Then I proceeded again in prolonged stretching. I started from stretching both shoulders in all possible movements for 1 minute (flexion, extension, abduction, external and internal rotation), then both elbows (flexion,extension), then both radiocarpal joint (pronation, supination), then both wrists (dorsal flexion, palmar flexion, radial duction and ulnar duction). After stretching all the joints of UE for 1 minute, i performed stretching on LE. I started again by both hips (flexion, extension, abduction, adduction, internal and external rotation), then both knees (flexion, extension), and in ankles (dorsal flexion, plantar flexion, inversion and eversion) for 1 minutes on each joint. Patient during prolonged stretching she mentioned that she was feeling pain, in level 1/10 when stretching shoulder in flexion in left side, pain 1/10 when stretching external rotation of the left shoulder.
- Then I followed sensorimotor training to improve her stability. I asked my patient to take a hold from the ladder and to try to flex her left knee first and try to keep her posture, in ideal alignment by standing on one (right) leg, which was slightly flexed, by correcting her. Then we changed sides. After I took the disc balance cushion and we practice close to the Swedish ladder, so she was going to catch it in the situation she was going to lose her balance, and I ask my patient to try and stand in one leg with slightly flexed knee. Then she did the same exercise on the other side. We were practicing this exercise for 5 minutes, 10 seconds for each lower extremity consecutively. I also asked her to try to walk along a long balance pad, for 10 times, 2 sets by trying not to touch the floor with her feet.
- Then in the end, we practiced again gait in the corridor. Today her gait was almost perfect. I also noticed that her stability of walking was becoming better and better. We continued practicing her gait for 5 min., under my instructions.

Results:

Today patient after finishing the therapy wasn't feeling tired. After finishing my fifth therapy I noticed an improvement on the following:

- Shoulder on left side: Active Flexion: 125, Active abduction: 120, Active External Rotation: 40.
- Shoulder on right side: Active Flexion: 145, Active Abduction: 130

Self-therapy:

For self-therapy I asked her to perform the same exercises that she was doing for self-therapy (Active ROM exercises) by the use of elastic theraband, of light resistance.

Date: Thursday 28/01/2016

Today's present state:

- Today is my sixth physiotherapeutic session
- We didn't perform any therapy yesterday 27/01/2016 because my patient went to hyperbaric oxygen chamber, and then she had to be controlled by the doctors and ergo therapist to see her progression, and doctors indicated not to perform her any therapy.
- The patient today is in a good mood, she just finished her therapy of hyperbaric oxygen chamber, and she asked me to have a break of ten minutes, she prepared her coffee, drunk it and then she came to the physiotherapy room to start our session.

Goal of today's therapy:

- Increase ROM in both lower and upper extremities
- Reduce spasticity
- Improve muscle length
- Improve Joint Play in restricted joints
- Improve stability
- Correct gait

Procedure:

- Today, for increasing ROM I used again PNF techniques. I used Contract-Relax technique. First I applied the diagonal of 1^{st} flexion of upper extremities and 1^{st} extension of upper extremities on both sides. Then I proceed on 2^{nd} diagonal flexion and 2^{nd} diagonal extension of both sides. Afterwards, we continued by the same technique of Contract-Relax on all possible diagonals of lower extremities (1^{st} flexion diagonal, 1^{st} extension diagonal, 2^{nd} flexion diagonal, 2^{nd} extension diagonal). Then I also applied the same relaxation technique to pelvis and to scapula, on anterior elevation, anterior depression, posterior elevation, and posterior depression.
- Then I used Dynamic Reversals to increase the strength and control the range of motion of the newly gained range of motion. So I applied this strengthening technique in upper

extremities (1st diagonal flexion and extension, 2nd diagonal flexion and extension), then in lower extremities (1st diagonal flexion and extension, 2nd diagonal flexion and extension), then I also applied the same strengthening technique to pelvis and to scapula, on anterior elevation, anterior depression, posterior elevation, and posterior depression.

- Then I proceeded again in prolonged stretching. I started from stretching both shoulders in all possible movements for 1 minute (flexion, extension, abduction, external and internal rotation), then both elbows (flexion, extension), then both radiocarpal joint (pronation, supination), then both wrists (dorsal flexion, palmar flexion, radial duction and ulnar duction). After stretching all the joints of UE for 1 minute, i performed stretching on LE. I started again by both hips (flexion, extension, abduction, adduction, internal and external rotation), then both knees (flexion, extension), and in ankles (dorsal flexion, plantar flexion, inversion and eversion) for 1 minute on each joint. Patient during prolonged stretching she mentioned that the pain was relieved.
- Then I followed sensorimotor training to improve her stability. I took the disc balance cushion and we practice close to the Swedish ladder, so she was going to catch it in the situation she was going to lose her balance, and I ask my patient to try and stand in one leg with slightly flexed knee. Then she did the same exercise on the other side. We were practicing this exercise for 5 minutes, 10 seconds for each lower extremity consecutively. Then i placed on the floor different balance equipment (balance cushion, balance pads, bosu and versa steps) in a row, and I asked my patient to try to walk along this equipment row, and every new equipment she had to stand on it by one of her to lower extremities, semi flexed, for 5 seconds, and then to the next one the same for 5 minutes. She mentioned that this exercise was difficult for her but with my help in the beginning she was able to perform it, and then she was able to perform it by herself.
- Then in the end, we practiced again gait in the corridor under my instructions.

Results:

Today patient after finishing the therapy wasn't feeling tired. After finishing my sixth therapy I noticed an improvement on the following:

- Shoulder on left side: Active Flexion: 135, Active abduction: 125, Active External Rotation: 55.
- Shoulder on right side: Active Flexion: 160, Active Abduction: 140

Self-therapy:

For self-therapy I asked her to perform the same exercises that she was doing for self-therapy (Active ROM exercises) by the use of elastic theraband, of medium resistance.

Date: Friday 29/01/2016

Today's present state:

- Today is my seventh and last physiotherapeutic session
- The patient today is in a good mood, she just finished her therapy of hyperbaric oxygen chamber, and she asked me to have a break of ten minutes, she prepared her coffee, drunk it and then she came to the physiotherapy room to start our session.

Goal of today's therapy:

- Increase ROM in both lower and upper extremities
- Reduce spasticity
- Improve muscle length
- Improve Joint Play in restricted joints
- Improve stability
- Correct gait

Procedure:

- Today, for increasing ROM I used again PNF techniques. I used Contract-Relax technique. First I applied the diagonal of 1st flexion of upper extremities and 1st extension of upper extremities on both sides. Then I proceed on 2nd diagonal flexion and 2nd diagonal extension of both sides. Afterwards, we continued by the same technique of Contract-Relax on all possible diagonals of lower extremities (1st flexion diagonal, 1st extension diagonal, 2nd flexion diagonal, 2nd extension diagonal). Then I also applied the same relaxation technique to pelvis and to scapula, on anterior elevation, anterior depression, posterior elevation, and posterior depression.
- Then I used Dynamic Reversals to increase the strength and control the range of motion of the newly gained range of motion. So I applied this strengthening technique in upper extremities (1st diagonal flexion and extension, 2nd diagonal flexion and extension), then in lower extremities (1st diagonal flexion and extension, 2nd diagonal flexion and extension), then I also applied the same strengthening technique to pelvis and to

scapula, on anterior elevation, anterior depression, posterior elevation, and posterior depression.

- Then I proceeded again in prolonged stretching. I started from stretching both shoulders in all possible movements for 1 minute (flexion, extension, abduction, external and internal rotation), then both elbows (flexion, extension), then both radiocarpal joint (pronation, supination), then both wrists (dorsal flexion, palmar flexion, radial duction and ulnar duction). After stretching all the joints of UE for 1 minute, i performed stretching on LE. I started again by both hips (flexion, extension, abduction, adduction, internal and external rotation), then both knees (flexion, extension), and in ankles (dorsal flexion, plantar flexion, inversion and eversion) for 1 minute on each joint. Patient during prolonged stretching she mentioned that the pain was relieved.
- Then I followed sensorimotor training to improve her stability. I placed again on the floor different balance equipment like yesterday (balance cushion, balance pads, bosu and versa steps) in a row, and I asked my patient to try to walk along this equipment row, and every new equipment she had to stand on it by one of her to lower extremities, semi flexed, for 5 seconds, and then to the next one the same for 5 minutes. Then i proceed in another exercise. I placed the bosu on the floor, and I ask my patient to try to stand in one leg, by having her knee in slightly flexed position, and in the same time I was throwing her the overball and she should try to catch it. We practice this exercise for 5 minutes, 20 seconds on each leg and then 40 seconds brake.
- Then in the end, we practiced again gait in the corridor under my instructions.

Results:

Today patient after finishing the therapy wasn't feeling tired. After finishing my last therapy I noticed an improvement on the following:

- Shoulder on left side: Active Flexion: 150, Active abduction: 130, Active External Rotation: 65.
- Shoulder on right side: Active Flexion: 170, Active Abduction: 150

Self-therapy:

For self-therapy I asked her to perform the same exercises that she was doing for self-therapy (Active ROM exercises) by the use of elastic theraband, of medium resistance.

3.6 Final Kinesiologic examination:

3.6.1 Observation

- Patient was able to stand stable
- Both of her elbows were not in semi flexed position anymore
- Both of her shoulder girdles were in ideal position

3.6.2 Postural examination

Posterior view:

- Base of support was smaller
- Same shape and size of both ankles
- Popliteal fossas were on the same level
- Subgluteal lines were on the same level
- Iliac spines were seem in the same level
- Normal shape of the spine
- Elbows weren't in semiflexed position but still thoracolumbar triangle on the left was bigger in shape than the right
- Left scapula was slightly higher than the right
- Shoulder girdles were on the same level
- Head was in neutral position

Lateral view from the right side:

- Ankles on the same level
- Knees on the same level
- Lumbar spine is flat
- Thoracic and cervical spines were normal in shape
- Shoulders where on the same level
- Elbows weren't semi flexed anymore

Lateral view from the left side:

- Ankles on the same level
- Knees on the same level
- Lumbar spine is flat
- Thoracic and cervical spines were normal in shape
- Shoulders where on the same level

Anterior view:

- Feet are not flat, and they are symmetrical
- Ankles are same in shape and symmetrical
- Knees are symmetrical
- Elbows weren't in semi flexed position anymore, and thoracolumbar triangles were different in shape with left one being smaller
- Chest and abdomen were symmetrical
- Shoulder girdles were on the same level
- Head was in neutral position

- Single leg stance: She was able to perform it on both sides without losing her balance
- Two scale test: Right side: 40 kg Left side: 37 kg so it was normal because results didn't exceed the 10% of difference
- Dynamic Spine Examination:

- Flexion: During flexion I observed normal movement in the thoracic region, lumbar area was flat, and the spines in cervical spine were prominent
- Extension: During extension I saw normal movement in thoracic region, also cervical spine was extending quiet well, but the bigger problem was in lumbar area that there was almost no movement
- Lateral flexion to the right: During lateral flexion to the right her pelvis started moving towards the other side, but the movement was greater than before my physiotherapies sessions, and i observed that again most of the movement was in thoracic spine, cervical spine was also moved quiet well but in lumbar spine it was just a small movement.
- Lateral flexion to the left: During lateral flexion to the left her pelvis started moving towards the other side, but the movement was greater than before my physiotherapies sessions, and i observed that again most of the movement was in thoracic spine, cervical spine was also moved quiet well but in lumbar spine it was just a small movement.

- Romberg test: patient was able to stand with normal base of support, when standing with feet together she was able again to perform it, and when standing with feet together and closed eyes she lost her balance after 10 seconds of performing the test.
- Trendelenburg sign: When standing on right side she was able to maintain the position of her pelvis and her trunk, and when standing on her left side she was able to keep the position but whole her body and her pelvis was shifting to the right to be able to stand

3.6.3 Gait Examination

- Walking rhythm was periodic
- Walking speed was slow
- Stride length was short
- Movement of the foot was good, she was first touching the floor with heel strike, then physiological proceeding to flat foot, loading response, heel-off phase and toe-off phase
- Position and movement of the pelvis was okay with the lateral tilt of the pelvis not exceeding 4cm
- Movement of her Upper extremities was good but still her left hand needed some improvement
- Head during walking was in ideal position
- Stability of walking was good

3.6.4 Breathing Examination

My patient was lying in supine position during examining her breathing

- Patient breathing wave was improved, and was able to breathe along the upper and lower thoracic and even in abdomen
- Movement of the ribs was good

3.6.5 Fascia examination

Examination of fascia on chest: There was no restricted fascia on upper thoracic region. No restriction when examining lower thoracic. I also examined upper extremities on medial and lateral direction but there was no restriction on both sides, also I examined thoracolumbar region in crania and caudal direction and there was no restriction.

3.6.6 Muscle tone Examination

Tested Muscle	Left	Right
Pectoralis major	Hypertonic	Hypertonic
Supraspinatus	Hypertonic	Hypertonic
Infraspinatus	Hypertonic	Hypertonic
Deltoid anterior	Hypertonic	Hypertonic
Deltoid middle	Hypertonic	Hypertonic
Deltoid posterior	Hypertonic	Hypertonic
Terres minor	Hypertonic	Hypertonic
Biceps brachii	Hypertonic	Hypertonic

Triceps brachii	Normal tone	Normal tone
Latissimus dorsi	Normal tone	Normal tone
Upper part of trapezius	Normal tone	Normal tone
Serratus anterior	Normal tone	Normal tone
Iliopsoas	Normal tone	Normal tone
Gluteus maximus	Normal tone	Normal tone
Tensor fascia latae	Normal tone	Normal tone
Quadriceps femoris (rectus femoris, vastus medialis, intermedius, lateralis)	Normal tone	Normal tone
Semitendinosus	Normal tone	Normal tone
Semimembranosus	Normal tone	Normal tone
Biceps femoris	Normal tone	Normal tone
Gastrocnemius	Normal tone	Normal tone

Table No. 8 – Final Kinesiologic Examination – Muscle tone examination according to Lewit

3.6.7 Muscle length test

Examined muscle	Left	Right
Gastrocmemius (According Kendall)	Normal	Normal
Soleus (According Kendall)	Normal	Normal
Hamstrings (According Kendall)	Normal	Normal
Hip flexors (According Kendall)	Normal	Normal
Pectoralis major (According Kendall)	Shortness	Shortness
Pectoralis minor (According Kendall)	Normal	Normal
Teres major, latissimus dorsi, rhomboids (According Kendall)	Shortness	Shortness
Medial shoulder rotators (According Kendall)	Normal	Normal
Lateral shoulder rotators (According Kendall)	Shortness	Shortness
Trapezius (According Janda)	Grade 0	Grade 0
Levator scapulae (According Janda)	Grade 0	Grade 0

Table No. 9 – Final Kinesiologic Examination – Muscle lenth test according to Kendall and Janda

3.6.8 ROM Examination by Kendall

SHOULDER JOINT				
Plane	**Left**		**Right**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	30-0-150	30-0-155	30-0-170	30-0-170
F	130-0-0	135-0-0	150-0-0	155-0-0
R	65-0-90	70-0-90	75-0-90	80-0-90

ELBOW JOINT				
Plane	**Left**		**Right**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	0-0-125	0-0-125	0-0-125	0-0-125

RADIOULNAR JOINT				
Plane	**Left**		**Right**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
R	80-0-80	85-0-80	80-0-80	80-0-80

HIP JOINT				
Plane	**Left side**		**Right side**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	20-0-120	30-0-130	20-0-125	30-0-135
F	35-0-25	40-0-25	35-0-25	40-0-25
R	40-0-35	45-0-40	40-0-35	45-0-40

KNEE JOINT				
Plane	**Left side**		**Right side**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	0-0-115	0-0-130	0-0-115	0-0-130

ANKLE JOINT				
Plane	**Left side**		**Right side**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	20-0-60	25-0-65	20-0-60	25-0-65
R	25-0-30	25-0-35	25-0-30	25-0-35

Table No. 10 – Final Kinesiologic Examination – Range of motion examination according to Kendall

3.6.9 Joint play examination according to Lewit

Joint	Left	Right
Springing of shoulder joint in caudal direction with hand in 90 abduction	Not Restricted	Not Restricted
Acromioclavicular joint (ventrodorsal and craniocaudal)	Not Restricted	Not Restricted
Springing of elbow (radial and ulnar direction)	Not Restricted	Not Restricted
Dorsal shifting of the proximal row of carpal bones relative to the radius.	Not Restricted	Not Restricted
Palmar shifting of the distal row of carpal bones relative to the proximal row.	Not Restricted	Not Restricted
Metatarsophalangeal joints in palmar, dorsal and lateral directions	Not Restricted	Not Restricted
Interphalangeal joints in palmar, dorsal and lateral directions	Not Restricted	Not Restricted
Patella (medial, lateral, cranial and caudal directions)	Not Restricted	Not Restricted
Tibiofibular joint in dorsal and ventral directions	Not Restricted	Not Restricted
Talocrural joint in dorsal and ventral directions	Not Restricted	Not Restricted
Lisfranc’s joint in dorsal and ventral directions	Not Restricted	Not Restricted

Chopart's joint in dorsal and ventral directions	Not Restricted	Not Restricted
Metatarsophalangeal joints in plantar, dorsal and lateral directions	Not Restricted	Not Restricted
Interphalangeal joints in plantar, dorsal and lateral directions	Not Restricted	Not Restricted
Ribs in ventral and dorsal direction	Not Restricted	Not Restricted

Table No. 11 – Final Kinesiologic Examination – Joint play examination according to Lewit

3.6.10 Neurological Examinations and special tests

Test	Left Side	Right Side
Babinsky sign	Positive (dorsal flexion of hallux)	Positive (dorsal flexion of hallux)
Chaddock's sign	Positive (dorsal flexion of hallux)	Positive (dorsal flexion of hallux)
Mingazzini test (lower extremities)	Positive because when testing, her right UE was falling down	
Mingazzini test (lower extremities)	Positive because when testing, her left LE was falling down	
Barre sing	Negative	

Table No. 12– Final Kinesiologic Examination – Neurological examinations

Deep Tendon Reflexes (Grading According to Vele)		
	Left	Right
Biceps reflex	3	3
Triceps reflex	4	3
Brachioradialis reflex	3	3
Knee reflex	4	3
Achilles tendon reflex	3	3

Table No. 13 – Final Kinesiologic Examination – Deep tendon reflexes according to Vele

*Evaluation grades, according to Vele, where grade 3 is considered as normal grade and grade 4 hyper reflexive grade.

We also examined her ability to grip, and she was able to do it in both sides, opposition, and she was able to do it in both sides, and moreover we ask her to try to touch her nose with her hand and she was also able to do it in both sides.

I also evaluated her spasticity once more in both Upper and Lower Extremities, by following Modified Ashworth Scale which evaluates the resistance when passively trying to move the part of the body, where its grading varies from 0-4 (0: no increase in muscle tone, 1: slight increase in muscle tone, 2: more marked increased in muscle tone, 3: considerable increase in muscle tone and passive movement is difficulty performed, 4: part is rigid in flexion or extension)

Modified Ashworth Scale		
	Right side	Left side
Wrist	0	0
Elbow	0	1
Shoulder	1	2
Hip	0	0
Knee	0	0
Ankle	0	0

Table No. 14 – Final Kinesiologic Examination – Modified Ashworth Scale

3.7 Evaluation of the Effect of the Therapy:

Comparing the results of initial kinesiologic examination and final kinesiologic examination, therapy was effective for my patient, and that was also seem by me, my supervisor but even from the patient. Her ability to perform daily activities was easier for her. Fascia restriction was released, and in combination with the breathing exercises we improved her breathing pattern. Spasticity in her lower extremities was fully relieved, and in combination with the improvement of the mobility of her joints, and the elongation of her shorted muscles her posture and her gait pattern were improved. Her ROM was also increased in satisfactory levels but in her right upper extremity because the spasticity was still in high levels, wasn't improved as in the other extremity. Because of her good progression we were able to emphasize also to improve her

stability and her proprioception, with the sensorimotor training. Even though, we could see that her overall body strength was improved, because during the first therapies she was getting exhausted after finish our therapies, but later on we saw that we were progressing in more and more difficult exercises with her being able to perform them.

Before Therapy			**After Therapy**	
Left	**Right**	**Tested Muscle**	**Left**	**Right**
Hypertonic+	Hypertonic+	**Pectoralis major**	Hypertonic	Hypertonic
Hypertonic+	Hypertonic+	**Supraspinatus**	Hypertonic	Hypertonic
Hypertonic+	Hypertonic+	**Infraspinatus**	Hypertonic	Hypertonic
Hypertonic+	Hypertonic+	**Deltoid anterior**	Hypertonic	Hypertonic
Hypertonic+	Hypertonic+	**Deltoid middle**	Hypertonic	Hypertonic
Hypertonic+	Hypertonic+	**Deltoid posterior**	Hypertonic	Hypertonic
Hypertonic+	Hypertonic+	**Terres minor**	Hypertonic	Hypertonic
Hypertonic+	Hypertonic+	**Biceps brachii**	Hypertonic	Hypertonic
Hypertonic	Hypertonic	**Triceps brachii**	Normal tone	Normal tone
Normal tone	Normal tone	**Latissimus dorsi**	Normal tone	Normal tone
Hypertonic+	Hypertonic	**Upper part of trapezius**	Normal tone	Normal tone
Normal tone	Normal tone	**Serratus anterior**	Normal tone	Normal tone
Hypertonic	Normal tone	**Iliopsoas**	Normal tone	Normal tone
Hypertonic	Hypertonic	**Gluteus maximus**	Normal tone	Normal tone
Hypertonic	Hypertonic	**Tensor fascia latae**	Normal tone	Normal tone
Hypertonic	Normal tone	**Quadriceps femoris (rectus femoris, vastus medialis, intermedius, lateralis)**	Normal tone	Normal tone
Hypertonic	Normal tone	**Semitendinosus**	Normal tone	Normal tone
Hypertonic	Normal tone	**Semimembranosus**	Normal tone	Normal tone
Hypertonic	Normal tone	**Biceps femoris**	Normal tone	Normal tone
Hypertonic	Hypertonic	**Gastrocnemius**	Normal tone	Normal tone

Table No. 15 - Comparing muscle tone before and after therapy, light blue colour highlight indicates improved data

Before Therapy			After Therapy	
Left	**Right**	**Examined muscle**	**Left**	**Right**
Shortness	Shortness	Gastrocmemius (According Kendall)	Normal	Normal
Shortness	Normal	Soleus (According Kendall)	Normal	Normal
Normal	Normal	Hamstrings (According Kendall)	Normal	Normal
Normal	Normal	Hip flexors (According Kendall)	Normal	Normal
Shortness	Shortness	Pectoralis major (According Kendall)	Shortness	Shortness
Shortness	Shortness	Pectoralis minor (According Kendall)	Normal	Normal
Shortness	Shortness	Teres major, latissimus dorsi, rhomboids (According Kendall)	Shortness	Shortness
Shortness	Shortness	Medial shoulder rotators (According Kendall)	Normal	Normal
Shortness	Shortness	Lateral shoulder rotators (According Kendall)	Shortness	Shortness
Grade 2	Grade 1	Trapezius (According Janda)	Grade 0	Grade 0
Grade 2	Grade 1	Levator scapulae (According Janda)	Grade 0	Grade 0

Table No. 16 - Comparing muscle length before and after therapy, light blue colour highlight indicates improved data

SHOULDER JOINT				
Plane	**Left**		**Right**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	[+20]-0-[+60]	[+15]-0-[+55]	[+10]-0-[+60]	[+10]-0-[+60]
F	[+40]-0-0	[+45]-0-0	[+40]-0-0	[+40]-0-0
R	[+55]-0-[+10]	[+55]-0-[+5]	[+20]-0-0	[+30]-0-0

ELBOW JOINT				
Plane	**Left**		**Right**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	[+10]-0-[+35]	[+10]-0-[+15]	[+5]-0-[+5]	0-0-0
RADIOULNAR JOINT				
Plane	**Left**		**Right**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
R_s	0-0-[+20]	0-0-[+20]	0-0-0	0-0-0
HIP JOINT				
Plane	**Left side**		**Right side**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	[+10]-0-[+30]	[+10]-0-[+10]	[+10]-0-[+25]	[+5]-0-[+5]
F	[+10]-0-[+5]	[+10]-0-[+5]	[+10]-0-[+5]	[+10]-0-[+5]
R	[+10]-0-[+15]	[+10]-0-[+15]	0-0-[+10]	0-0-[+15]

KNEE JOINT				
Plane	**Left side**		**Right side**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	0-0-[+15]	0-0-0	0-0-[+15]	0-0-0
ANKLE JOINT				
Plane	**Left side**		**Right side**	
	Active Movement	**Passive Movement**	**Active Movement**	**Passive Movement**
S	[+15]-0-0	[+15]-0-0	[+15]-0-0	[+15]-0-0
R	[+5]-0-[+10]	[+5]-0-[+15]	[+5]-0-[+10]	[+5]-0-[+15]

Table No. 17 - Comparing range of motion improvement after therapy, light blue colour highlight indicates improved data

Modified Ashworth Scale				
Right side	Left side		Left side	Right side
0	1	Wrist	0	0
1	1	Elbow	0	1
2	3	Shoulder	1	2
0	1	Hip	0	0
0	1	Knee	0	0
1	1	Ankle	0	0

Table No. 18 - Comparing spasticity in extremities before and after therapy, light blue colour highlight indicates improved data

3.7.1 Prognosis

About the prognosis of my patient, I think that if she continues practicing hard as she was doing during my physiotherapy sessions, and her situation will not have any complication, which this doesn't depend on her, she will be able to have a physiological and good quality of life as she used to have before her episode.

4. Conclusion

Checking day-by-day, I could see that the therapy was effective. All of our goals that we were setting before each therapy were achieved. With the cooperation of my patient, we achieved to correct as much as possible in the period of 2 weeks. We improved ROM, muscle shortness, strength, gait, posture, mobility of the joints, and even a decrease in the spasticity levels. Now I could see that my patient was gained even confidence when walking and performing the exercises.

For me as a student, I also gained a lot of experiences during my practice, which are giving me motivation for the future. Also thanks to my supervisor, I learn even more things not only when referring to the physiotherapy session as a physiotherapist, but also in general he improve my confidence with the patients and even he explained me how to deal with each situation.

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6. Supplements

6.1 Ethical Board

UNIVERZITA KARLOVA V PRAZE
FAKULTA TĚLESNÉ VÝCHOVY A SPORTU
José Martího 31, 162 52 Praha 6-Veleslavín

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: Case Study of Physiotherapy Treatment of a Patient with the Diagnosis of Anterior ST-segment elevation myocardial infraction
Project form: Bachelor
Period of realization of the project: 18/1/2016 till 29/1/2016
Applicant:
Main researcher: Ioannis Hadjigiannis
Co-researcher(s): PhDr. Lenka Satrapová, Ph.D.
Supervisit: BSc. Tomas Modlinger

Project description: Physiotherapeutic post operative rehabilitation and spasticity management for a patient after myocardial infarction, ST segment elevation. All the methods and therapeutic procedures which are used or applied are according to hospital's preventive regimes for post operative care. The methods that are used from the researcher are based on the knowledge which was obtained during the three years of bachelor study of physiotherapy program in UK-FTVS, Prague. The methods which are used are: non invasive assessment, clinical examinations, short and long term rehabilitation plan, differential diagnosis, and non invasive physiotherapeutic methods including joint play, passive movements, PNF, prolonged stretching, sensor motor training and respiratory physiotherapy.

Ensuring safety within the research: For this particular research the researcher doesn't use any invasive methods. The research is taking place in physiotherapy department of Kladno Hospital in Kladno. All the precautions and risk preventions are followed according to the specific hospital rules, policies and signed documentations. All the rehabilitation regimes were designed, prescribed and approved from the responsible medical doctor. All of the implemented procedures including assessments, therapy, discussions and any kind of communication between patient and researcher were in front of the physical presence of the responsible supervision of BS.c. Tomas Modlinger.

Ethical aspects of the research: All the members and, or, participants in particular research project are adults and non-vulnerable. All the personal data are anonymous and will be preserved in anonymous form.

Informed Consent: attached

It is a 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, 7/04/2016 Applicant's signature:

Approval of UK FTVS Ethics Committee

The Committee: Chair: doc. PhDr. Irena Parry Martínková, Ph.D.
Members: prof. PhDr. Pavel Slepička, DrSc.
doc. MUDr. Jan Heller, CSc.
doc. Ing. Monika Šorfová, Ph.D.
Mgr. Pavel Hrásky, Ph.D.
MUDr. Simona Majorová

The research project was approved by UK FTVS Ethics Committee under the registration number: 095/2016
Date of approval: 7.4.2016

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.

Stamp of UK FTVS UNIVERZITA KARLOVA v Praze Fakulta telesne vychovy a sportu José Martiho 31, 162 52, Praha 6 1

Signature of the Chair of UK FTVS Ethics Committee

6.2 INFORMOVANÝ SOUHLAS

UNIVERZITA KARLOVA V PRAZE
FAKULTA TĚLESNÉ VÝCHOVY A SPORTU
José Martího 31, 162 52 Praha 6-Veleslavín

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 OBLASTNÍ NEMOCNICE KLADNO, 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 TOMÁŠ MOLKINGER 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 18.01.2016

Jméno a příjmení pacienta Podpis pacienta:

Jméno a příjmení zákonného zástupce .....

Vztah zákonného zástupce k pacientovi ..... Podpis: .....

6.3 List of pictures:

Picture 1- General structure and location of the heart
Picture 2- Main arteries and veins of the heart
Picture 3- Internal structure of the heart
Picture 4- Coronary arteries of the heart
Picture 5- Cardiac Conduction of the heart

6.4 List of tables:

Table No. 1 – Initial Kinesiologic Examination - Muscle tone examination
Table No. 2 – Initial Kinesiologic Examination - Muscle length test according to Kendall and Janda
Table No. 3 – Initial Kinesiologic Examination - Range of motion examination of shoulder joint, elbow joint, radioulnar joint, hip joint, knee joint and ankle joint
Table No.4 – Initial Kinesiologic Examination - Joint play examination according to Lewit
Table No. 5 – Initial Kinesiologic Examination - Neurological Examinations
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Table No. 18 - Comparing spasticity in extremities before and after therapy, light blue colour highlight indicates improved data

6.5 List of abbreviations:

AV – Atrioventricular

SI – Sinoatrial

NE – Norepinephrine

CNS – Centeal Nervous System

PNF – Proprioceptive Neuromuscular Facilitation

BMI – Body Mass Index

ROM – Range Of Motion

UE – Upper Extremity

LE – Lower extremities