Faculty of Physical Education and Sport UK, Prague
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CERVICOBRACHIAL SYNDROME

Bachelor Thesis

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ABSTRACT

TITLE: Cervicobrachial syndrome

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AIM: In this thesis it will be analysis of the cervicobrachial syndrome theory and of the practical therapeutic execution.

METHODS: The therapy included six meetings with the patient during two weeks. The patient was taught to sit in the work according to the Brugger sitting pattern to correct her incorrect sitting during the work. PIR techniques were performed at every session for the relaxation of hypertonic muscles, stretching techniques to elongate the shortened muscles, mobilization of restricted joints and strengthening exercises of the week muscles. Because of the incorrect breathing pattern the breathing exercises were performed and a therapy plan for the autotherapy was proposed to the patient.

RESULTS: After the six sessions improvements were detected in the final kinesiologic examination. Shortened muscles were elongated, hypertonic muscles were relaxed, restricted ROM of shoulder joint and head were increased, and strength of muscles around scapula and cervical spine was improved. Results of the therapeutic approach, theoretical analysis of the cervicobrachial syndrome and literature approaches for the examination and treatment of the syndrome are discussed.

KEY WORDS: Cervicobrachial syndrome, muscle imbalances, headache, shoulder pain, trigger points, restricted range of motion, weak muscles.

DECLARATION

I declare that this Bachelor Thesis is based entirely on my own individual work, and on my own practice that took place in Central military hospital in Prague from4/2/2008 until 15/2/2008.

All the information used for the development of this Bachelor Thesis has been taken from the list of literature that exists in the end of this Thesis.

In Prague, 2008
Fragkiskos Bon
Fragkiskos Bon

DEDICATION

To my family, who is always there for me

To my supervisor Agnieszka Kaczmarska

To the professors whom I had the luck to be taught from

To people that helped me with this work

ACKNOWLEDGEMENTS

I would like to specifically thank my mother Sofia, who did not stop believing in me throughout my study years.

I would like to thank my supervisor Agnieszka Kaczmarska for the advices and the instructions she gave me during the elaboration of this thesis.

Contents:

1. PREFACE

The spinal column is one of the most important parts of our body. Its basic characteristics are the structure and support. It allows the body to move freely and to bend with flexibility. The spine is also designed to protect our spinal cord. The spinal cord is a column that contains nerve cells (grey matter) and pathways (white matter). From the spinal cord are emerging anterior and posterior roots and then peripheral nerves are formed that connect the brain to the parts of the body. (21)

One of the problems is the cervicobrachial Syndrome- it causes pain, numbness, and/ or tingling from the neck, down the arm and to the hand. (2)

For the patients with Cervicobrachial syndrome, the main goal is to relief the pain, to regain motion and functional movements without movement restriction. To achieve the demanded goals during therapeutic sessions therapist should have knowledge of the basic principles and effects of exercises in musculoskeletal, neuromuscular, cardiovascular and respiratory system. Acquired knowledge includes the correlation of anatomy and kinesiology of the treated area and understands the condition of the injury, pathology or surgical approach as well as the possible rhythm of recovery, complication, preventions and contraindications. Furthermore, the therapist should be able to provide an efficient assessment of the patient in both physical and psychological ways. (12)

2. GENERAL PART

Overview of the vertebral column

The vertebral column forms the main part of the axial skeleton. The latter consists of, the skull, sternum, and ribs. The vertebral column forms a strong but flexible support for the trunk. It has important roles in posture, support of body weight, locomotion, and protection of the spinal cord and nerve roots. (21)

The spinal column consists of 33 bones called vertebrae; there are seven in the cervical region, twelve in the thoracic, five in the lumbar, five in the sacral, and four in the coccygeal. Only 24 of them are movable and these are of the cervical, thoracic and lumbar spine. They give the vertebral column considerable flexibility. Those of the sacral and coccygeal regions, in adults, are termed as fixed vertebrae, because the sacral vertebrae are fused to form the sacrum and the four coccygeal vertebrae are fused to form the coccyx. (5)

General characteristics of the vertebral column

- A vertebra has basically a ventral body and a dorsal, vertebral or else called neural arch. Together they enclose the vertebral foramen, which is occupied by the spinal cord, the meninges and vessels.

- The vertebral arch consists of a pair of pedicles and a pair of laminae, and supports seven processes, four articular, two transverse, and one spinous.

- When the opposed surfaces of the adjacent bodies bound together, there is formation of a pillar for the support of the head and trunk, and the vertebral foramina constitute a canal for the protection of the medulla spinalis (*spinal cord*), while between every pair of vertebrae are two apertures, the intervertebral foramina, one on either side, for the transmission of the spinal nerves and vessels.

- The vertebral body is the largest part of a vertebra, and is more or less cylindrical in shape. Its upper and lower surfaces are flattened and rough, and give attachment to the intervertebral fibro cartilages, and each presents a rim around its circumference. In front, the body is convex from side to side and concave from above downward. Behind, it is flat from above downward and slightly concave from side to side. Its anterior surface presents a few small apertures, for the passage of nutrient vessels; on

the posterior surface is a single large, irregular aperture, or occasionally more than one, for the exit of the basic-vertebral veins from the body of the vertebra.

- The pedicles are short, thick, rounded dorsal projections from the body at the junction of its posterior and lateral projections. The concavities above and below the pedicles are named the vertebral notches, and when the vertebrae are articulated, the notches of each contiguous pair of bones form the intervertebral foramina.

- The laminae are vertically flat and they curve posteriorly and medially to complete with the base of the spinous process, a vertebral foramen.

- The spinous process is directed backward and downward from the junction of the laminae. The spinous processes acts as levers for muscles, in other words, they serve for the attachments of ligaments and muscles.

- The articular processes, two superior and two inferior, spring from the junctions of the pedicles and laminae. The superior processes project cranially, with articular facets directed dorsally, while the inferior project in a caudal direction and the articular facets facing ventrally.

- The transverse processes project laterally, one at each side, from the point the lamina joints the pedicle, between the superior and inferior articular processes.

- The vertebrae from the axis to the first sacral vertebra articulate with one another at joints between their bodies and between their articular processes. The intervertebral discs provide the strongest attachment between the bodies of the vertebrae

- The intervertebral discs are plates of fibrocartilage. They play an important role in weight bearing and a lesser role in movement. Each disc is composed from an external annulus fibrosus which surrounds the internal nucleus pulposus. The latter works as a shock absorber for axial forces, and like a semifluid ball bearing during flexion, extension, rotation and lateral flexion of the spinal column.

- The bodies are united by long strong anterior and posterior longitudinal ligaments, and by short ligaments called, ligament flava, inter-spinalia, inter-transversalia, capsular ligaments.

- The curves of the vertebral column have four parts. The thoracic and sacral curvatures are concave anteriorly, whereas the cervical and lumbar curvatures are concave posteriorly. (5, 21)

2.1 Cervical Spine

The cervical spine is located between the skull and the thorax. The seven vertical vertebrae, which are the smallest of the movable vertebrae, have a distinctive feature, the foramen, present in each transverse process. The first, second and seventh vertebrae must be considered separately because of their special features. (9)

The spinous process is short and bifid, the two divisions being often of unequal size. The superior and inferior articular processes on either side are fused to form an articular pillar, which projects laterally from the junction of the pedicle and lamina. The articular facets are flat and of an oval form: the superior look backward, upward, and slightly medially: the inferior forward, downward, and slightly in lateral direction. The transverse processes are each pierced by the foramen transversarium, which, in the upper six vertebrae, gives passage to the vertebral artery and vein and a plexus of sympathetic nerves. (9)

Each process consists of an anterior and a posterior part. The anterior portion is the homologue of the rib in the thoracic region, and is therefore named the costal process or costal element: it arises from the side of the body, is directed laterally in front of the foramen, and ends in a tubercle, the anterior tubercle. The posterior part, the true transverse process, springs from the vertebral arch behind the foramen, and is directed in a forward and lateral direction, and it ends in a flattened vertical tubercle, the posterior tubercle. (9, 21)

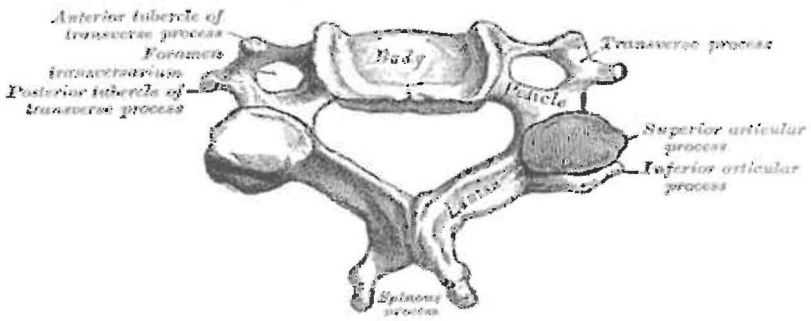

Figure 1(F1) above shows a cervical vertebra from a cranial view

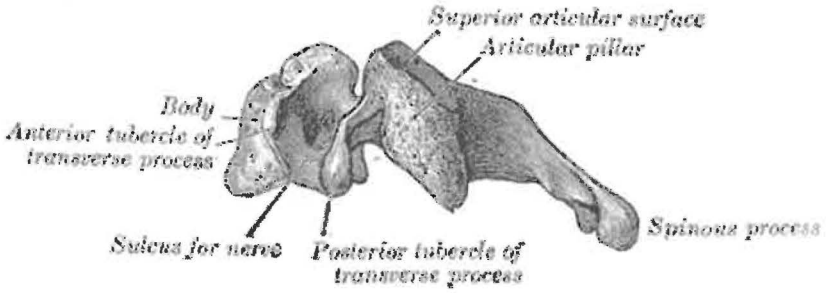

Figure 2(F2) shows the vertebra from a side view

The kidney-shaped, concave superior articular surfaces of atlas receive the two large protuberances at the sides of the foramen magnum – the occipital condyles. Through these condyles, the weight of the head is transmitted to the vertebral column. The atlas has no spinous process or body, and this is due to the fact that the body of the atlas has fused with that of the next vertebra. (9, 20)

The second vertebra is called axis, and is the strongest one because on it rotates the atlas that carries the skull. The distinguishing feature of the axis is the blunt tooth like dens (odontoid process), which projects superiorly from its body. The dens are held in position by the transverse ligament of the atlas, which prevents horizontal displacement of the atlas. (9, 21)

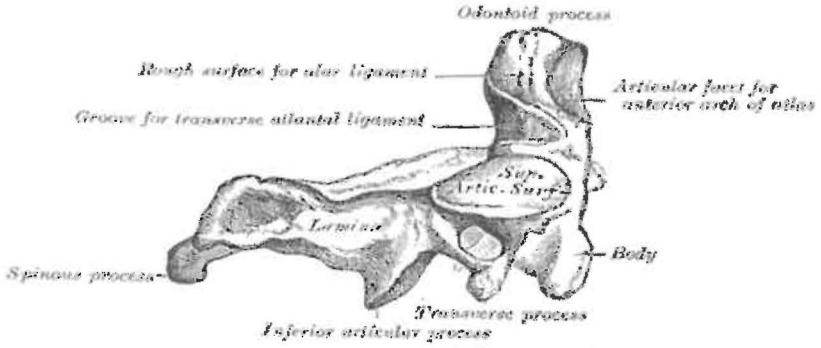

Figure 3 (F3) The second cervical vertebra seen from a side view

1.2 Kinesiology of the cervical spine

The movements in the sagittal plane are called flexion and extension, in the coronal plane lateral flexion, and in the horizontal plane rotation. The cervical spine's range of motion is 40 degrees for flexion, 45 degrees for extension, 35-45 degrees for latero-flexion and 60-75 degrees of rotation. (24)

In the whole cervical spine, during flexion the upper vertebral body tilts and slides anteriorly, compressing the intervertebral space anteriorly and driving the nucleus posteriorly and stretching the posterior fibers of the annulus. The principles are similar during lateral flexion. (15)

In addition, during extension the overlying vertebral body tilts and slides posteriorly. The intervertebral space is compressed posteriorly, the nucleus pulposus is directed anteriorly and the ventral fibers of the annulus fibrosus are stretched. (15)

The rotation of the cervical spine causes one vertebra to rotate on another. The articular facets slide to each other. This is followed by rotation and twisting of the intervertebral disc. (15)

Van Mameren determined that flexion is initiated at the lower cervical spine (C4 through C7), followed by motion at C0 (occiput) through C2, C2 through C3, and then C3 through C4. The C6 through C7 segment undergoes a brief reversal of motion into extension, followed by a reversal of motion at C0 through C2. The C6 through C7 segment contributes to the end ranges of flexion. Extension is also initiated in the lower cervical spine (C4 through C7) and is followed by the beginning of motion at C0 through C2. The middle range consists of varied movement from the mid cervical region, whereas the lower cervical spine is the last to contribute as the column moves into terminal extension. (22)

The ligaments play an important role to the range of motion, since it's their function to limit movements of the head and neck, and to maintain a postural equilibrium between the vertebrae. (9)

Upper and Lower cervical spine

Further, the cervical spine can be divided in upper and lower parts. The upper part of the cervical spine consists of the atlas, axis, and the third cervical vertebra. That is an important part, due to the connection it provides between the head and the spine, through the atlanto-occipital joint. The movements available in those joints are rotation, flexion and extension. (15)

During rotation to the right, in example, of the atlas on the axis, the atlas is rotated to the right with respect to the axis, or the axis is rotated to the left with respect to the atlas. Rotation to the left or to the right is accompanied with lateral flexion to the opposite side. Like wise

lateral flexion is impossible without rotation. Furthermore, when retraction of head is performed, the upper cervical segments flex while the lower cervical segments extend. (11)

The primary motions of the atlanto–occipital joint are flexion and extension. Werne states that rotation in the atlanto-occipital joint is impossible. Also, according to Swartz, lateral flexion and rotation of this segment is impossible because of the depth of the atlantal sockets in which the occipital condyles join in. The primary motions of this segment are flexion and extension. The range of motion for flexion and extension is 15 degrees. (21)

The atlanto-axial joint allows the atlas and head to rotate from side to side as a one unit. That is due to the odontoid process, which extends from the body of the axis, filling the facet of the atlas. The range of motion in this joint is 20-25 degrees and is possible with regards to the small ligaments which act to hold the dens, on which the atlas can rotate. (21)

The lateral superior and inferior articulating facets of the atlas and axis create a biconcave surface. The concavity of each articulating surface is due to the articular cartilage of the inferior and superior facets. This characteristic allows for the anterior and posterior translation of the articular surfaces, and as the atlas continues to rotate, it settles into the axis as the superior articular process on each side slides down the anterior and posterior rims of the convex inferior surfaces. (11)

The biconvex nature of the atlanto-axial articulation means that cervical spine flexion and extension often create motion in the direction opposite that being experienced in the atlas. Thus, when the cervical spine is flexing, the atlas extends, and when the cervical spine extends, the atlas flexes. This coupling motion is possible because the atlas is balanced on the concavity of the axis, and when the line of compression moves anterior to this balance point, as when the neck is extended, the atlas moves into flexion. The reverse follows as the cervical spine flexes, moving the line of compression posterior to the balance point and creating extension at the atlas. (23, 25)

The movements between the axis and the third cervical vertebrae are lateral flexion with a range of 8 degrees, rotation, flexion and extension. The movements are the same for the following vertebrae up to the fifth cervical vertebrae. (16)

The lower cervical spine is formed from the sixth cervical vertebra until the first thoracic vertebra. That is the Cervico-thoracic transit. The range of movements is bigger than the

upper cervical spine. For flexion and extension the range of motion is 35-45 degrees, for lateral flexion 45 degrees and for rotation 80-90 degrees. (16)

According to Vele, this area becomes often the focus of nociceptive signals, causing painful cervicobrachial symptoms. Often this part is overloaded mechanically because the movable cervical vertebrae transits on the stiff thoracic vertebrae. (16)

During the movements in the sagittal plane referred above, the spinal canal lengthens during flexion, shortens during extension. In lateral flexion or rotation, the ipsilateral foramina decrease in size and the contralateral enlarge. In a normal spine the degree of narrowing of the foramina, do not cause compression on any tissues contained within them. When the movement is excessive though, or when the vertebrae come closer together due to degenerative changes, the foramina can become constricted and hence compression may take place on the tissues. (11, 24)

2.3 Thoracic Spine

The thoracic vertebrae compose the middle part of the vertebral column, and it is located between the cervical and the lumbar vertebrae. The characteristic features of those bones are their costal facets, two on each side of the bodies, serving for the articulation with the heads of the ribs, and one facet on the transverse processes of the superior ten vertebrae, for articulation with the tubercles of the ribs. (21)

They present, on either side, two costal demi-facets, one above, near the root of the pedicle, the other below, in front of the inferior vertebral notch. These are covered with cartilage in the fresh state, and, when the vertebrae are articulated with one another, form, with the intervening intervertebral fibrocartilages, oval surfaces for the reception of the heads of the ribs. (5, 9)

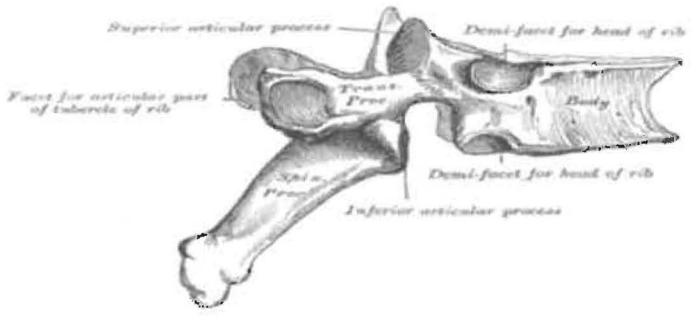

Figure 4 (F4) The thoracic vertebra seen from lateral view

2.4 Kinesiology of the thoracic spine

The thoracic vertebral column is connected to the thoracic cage via the ribs, and therefore it is significant to analyze the movements of the thoracic column and the associated changes in the thoracic cage. (11, 22)

During flexion, extension, lateral flexion and rotation the principles of movements is the same in the thoracic spine, as in the cervical spine, but more limited due to the connection with the ribs. The changes that occur during lateral flexion of the spine, to the contralateral side of the thorax are, elevation, the intercostal spaces increase in length, and the thoracic cage enlarges. On the ipsilateral side the opposite changes occur, the thoracic cage is lowered, and there is narrowing of the intercostal spaces. (23)

When flexion is performed on the thoracic column, the costovertebral angle increases, as well as the superior and inferior sternocostal angles increase. During extension all these angles become smaller. (11, 22)

The rotation would be greater if the thoracic column was not intimately connected with the thorax. Otherwise, under this movement the sternum resists the vertebral column via the ribs, which are connected on them. The result of this is that rotation of a vertebra will lead to distortion of the corresponding rib pair. Lastly the sternum lies obliquely so as to follow the rotation of the vertebral bodies. (22, 23)

The range of motion in this part is smaller than the cervical spine. The movements of flexion and extension are 5 degrees per segment, the rotatoty movement is about 8 degrees per segment, and the lateral flexion is approximately 6-8 degrees per movable segment. (11)

2.5 Ribs and Sternum

- The ribs are connected directly to the thoracic column.
- They are elastic arches, connected posteriorly with the thoracic vertebrae, as mentioned above, and anteriorly to the sternum.
- The superior seven pairs are connected by costal cartilages to the sternum, as true ribs. The remaining five are so called false ribs, because the cartilages from the eighth to the tenth join the superjacent costal cartilage, and the eleventh and twelfth are free at their anterior ends and therefore are called floating ribs.

- Between ribs are intercostal spaces, which are deeper in front and between the upper ribs. Upper ribs are less oblique than the lower and this obliquity is maximal at the ninth rib.

- The sternum consists of a cranial manubrium, an intermediate body or mesosternum and a caudal xiphoid process.

- The manubrium is broad and thick above, narrowing on its junction with the mesosternum. The superior border is thick, with a central jugular notch in the middle of the two clavicular notches. The inferior border articulates with the mesosternum.

- The lateral borders are marked with facets for the first costal cartilages, and below by articular demifacets, with one on each superior mesosternal angle, to joint the second costal cartilage.

- On each lateral border of the mesosternum, there are facets for the articulation from the second to seventh ribs.

- Anterior to superolateral angles of processus xiphoideus, are demifacets for parts of the seventh costal cartilage (9, 21)

2.6 The shoulder Girdle and the upper extremity

This girdle is formed by the clavicles and scapulae, and it connects the upper limb to the axial skeleton. The lower part of the cervical spine has relation to the upper extremities because of the muscles, and the nerves supplying the arms arise from the cervical spine. (22)

The shoulder girdle articulates with the sternum at the sternoclavicular joint, and with the upper limb at the shoulder and acromioclavicular joint. The clavicle extends laterally and almost horizontally across the neck of manubrium to acromion. Its flat lateral, acromial end articulates with the medial aspect of the acromion, while the enlarged medial, sternal end articulates with the manubrial clavicular facet and first costal cartilage. (22)

The scapula is connected to the axial system indirectly through the acromioclavicular joint. Muscle co-operation, joint connection and external forces can cause actual position of the scapula. The main functional connection of the scapula to the trunk is by muscles. (9)

The scapula overlaps in part the second to seventh ribs on the posterolateral thoracic aspect. It has costal and dorsal surfaces, superior, lateral and medial borders, superior, inferior and lateral angles, and spinous, acromial, and coracoid processes. The lateral angle is occupied by a glenoid cavity for articulation with the humerus. (9)

The humerus is the longest and largest bone in the upper extremity. The head at the proximal end, has an articular surface covered by hyaline cartilage, and is directed posteromedially and cranially to the glenoid cavity. Other parts, conclude the anatomical head, the lesser and the greater tubercle, the humeral shaft, the distal end of the humerus, the capitulum, the trochlea, and the media and lateral epicondyles. (9, 21)

2.7 The Axilla

The axilla is a roughly pyramidal space at the junction of the arm and thorax and is connected to the cervical spine and the upper extremities through the brachial plexus. The axilla provides a passage way for the important nerves and vessels, which reach the upper limb. The axilla consists of an apex, a base, and four walls. (21)

The apex is directed to the root of the neck and is located at the medial side of the root of the coracoid process of the scapula. Three major walls, the anterior wall of the clavicle, the posterior wall of the scapula, and the medial wall of the first rib, form the entrance to the axilla through which nerves and vessels pass. The base of the axilla is directed caudally, and is formed by the fascia and skin of the concave axilla. (21)

The anterior wall is formed from the clavicle and pectoral muscles. The lateral border of pectoralis major muscle forms the anterior axillary fold, whereas pectoralis minor and subclavius muscles form the deep layer of the anterior wall. (9, 21)

The posterior wall of the axilla is formed by the scapula and the subscapularis muscle. Under the subscapularis is the teres major muscle, which combines with the latissimus dorsi to form the posterior axillary fold. (9)

The medial wall of axilla is formed by the ribs and intercostal muscles, which are covered by the serratus anterior muscle. The latter is the main part of this wall. The lateral wall is formed by the floor of the intertubercular groove in the humerus. (20)

The axilla contains large nerves that are branches of the brachial plexus. These nerves pass from the neck to the upper limb. It also contains the axillary vessels. (9)

2.8 Muscles

Acting on the cervical spine

The muscles which are responsible for the motions of the cervical spine are the splenius capitis and cervicis, sternocleidomastoid, scalene group, semispinalis capitis and cervicis, longissimus capitis and cervicis, levator scapulae, interspinalis cervicis, iliocostalis cervicis, rectus capitis, obliquus capitis, and the intertransversarii. (12)

Acting on the shoulder girdle

The dorsal muscles include the infraspinatus, supraspinatus, deltoideus, subscapularis, teres major and minor, and the latissimus dorsi. On the other side, which is the ventral one, muscles included are pectoralis major and minor and the coracobrachialis. (12)

Muscles acting on the arm

The muscles that give motion to the arm are the biceps brachii, the brachioradialis, triceps brachii and anconeus. (22)

There are few muscles that connect the upper limb to the spine and those are, the trapezius, latissimus dorsi, levator scapulae, and the minor and major rhomboidei. Data for the above mentioned muscles are written in the appendix.

2.9 Brachial Plexus

It is a network of nerves located in the neck and axilla, composed of the anterior branches of the lower four cervical and first two thoracic spinal nerves and supplying the chest, shoulder, and arm. (21)

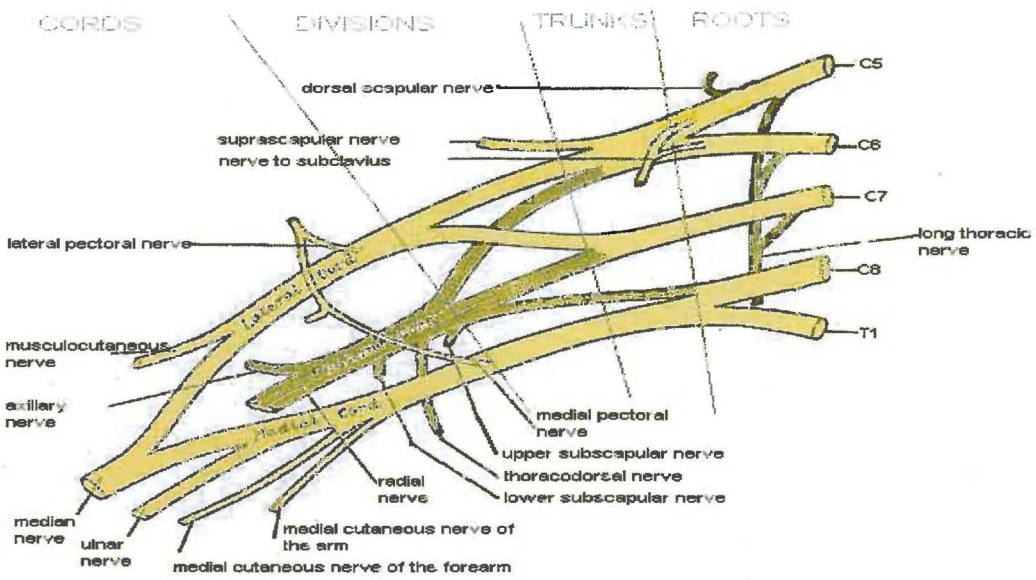

Figure 5 (F5) The brachial plexus

2.10 CERVICOBRACHIAL SYNDROME

The Cervico-brachial syndrome can be defined as pain in the distribution of a specific cervical nerve root as a result of compressive pathology. This syndrome may give rise to symptoms, such as diffuse pain irradiating from neck spine to upper limb in projection to certain dermatomes, or to the neck itself. Referred pain commonly appears to the region of shoulder or arm. In addition, headache, vertigo tinnitus and nausea are frequently reported. (20)

If the distribution of pain or paresthesia conveniently allows the identification of the affected root, a specific diagnosis can be made. The nerve from the brachial plexus follow a specific dermatome, and from the latter is possible to diagnose where the pain initiates. Symptoms may develop slowly, over a period of time, or may develop suddenly, usually by the application of external forces. There are often physical signs of nerve root irritation such as, diminished deep tendon reflexes, dermatomal sensory loss, and myotome weakness. (21)

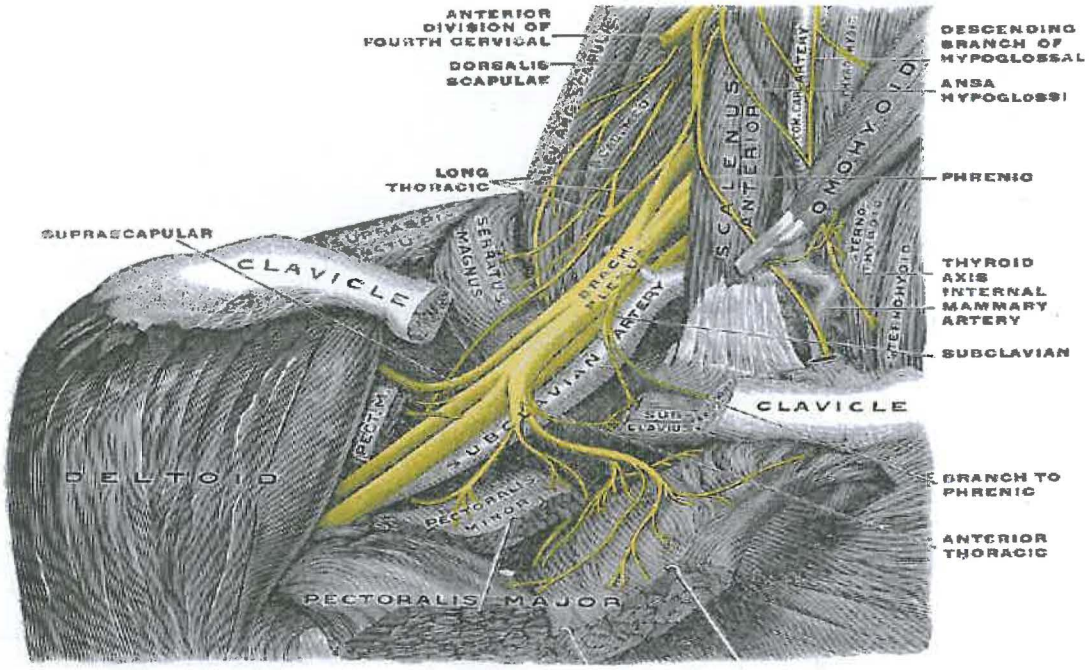

Figure 6 (F6). The brachial plexus.

2.11 Causes and differential considerations

It is important to determine if the pain is radicular or not, if it is not radicular then the term pseudoradicular is used. Radicular syndrome refers on a problem that causes compression of a nerve root.

Herniated disc

A herniated disc is the name given to the protrusion of the nucleus pulposus through the fibers of the annulus fibrosus and results in tension on annular fibers and compression on the nerve root causing pain. Clinically, the symptom is pain starting on the neck and radiates down to the shoulder, arm, forearm and into the hand. The onset of the radicular pain is gradual, although sometimes can be sudden. (1)

Table 1(T1).*Radicular Vs. Pseudoradicular syndrome.*

Radicular Syndrome	Pseudoradicular Syndrome
Follows one dermatome	Does not respect dermatomes
Sharp pain	Diffused pain

Muscle weakness according a nerve root distribution	Normal muscle power
Superficial sensation is defected	Normal sensation
Deep sensation may be defected	Normal deep sensation
Hyporeflexia	Normal reflexes

Table 2(T2). *Symptoms associated with nerve root compression*

Nerve root	Disc level	Symptoms
C3	*C2-C3*	*Pain and numbness in back of neck, especially at the mastoid process*
C4	*C3-C4*	*Pain and numbness in back of neck, radiating to levator scapulae and anterior chest*
C5	*C4-C5*	*Pain radiating from side of neck to top of shoulder; numbness over m. deltoideus*
C6	*C5-C6*	*Pain radiates down to the arm and forearm, thumb and index finger*
C7	*C6-C7*	*Pain radiates down to medial side of forearm*
C8	*C7-C8*	*Pain radiates down to medial aspect of forearm to ring and small finger*

Degenerative changes

With ageing, progressive degenerative changes cause a reduction in disc height. Those changes occurring in the intervertebral disc lead to a loss of shock-absorbing capacity and subsequently allow the transmission of forces to the apophyseal joints. The latter, as a result of the osteochondrotic disc impaction, are placed more closely together which in turn narrows

the intervertebral foramen. Thus apophyseal joint degeneration follows intervertebral disc degeneration. (7, 21)

Spondylosis

Cervical spondylosis refers to chronic degenerative changes in both the intervertebral discs and annuli in the region of the neck, as well as the formation of bony osteophyts, all of which may narrow the spinal canal causing spinal stenosis which may progress to myelopathy. Symptoms include headaches especially in the occipital region, tinnitus and progressive neck pain. (6)

Myelopathy

Myelopathy refers to the destruction of spinal cord tissue. It results from a wide variety of conditions in which the cervical spinal cord is compressed. Common causes include degenerative cervical spondylosis, tumors, and ossification of the posterior longitudinal ligament. The symptoms are headaches, pain in the shoulder with radiation to the arm. (4, 10, 14)

Whiplash

It is significant to be considered in patients after distortions and injuries of neck, a possible whiplash injury. This is an acceleration-deceleration mechanism of energy transferred to the neck. Specifically whiplash is the name given to the cervical injury due to sudden hyper extension or hyper flexion movement of the neck. Symptoms that manifest with this injury are headache, neck pain when moving the head, pain between the scapulae. (7)

Tumor

Neoplasm can affect the brachial plexus, when metastatic lesions of the cervical or axillary lymph nodes cause compression or invasion of the nerves in the neck, in the axilla, or upper arm. Specifically, breast cancer leads to compression of the median and ulnar nerves secondary to involvement of axillary nodes that compress the anteromedial aspect of the plexus. (13)

The clinical symptoms, associated with tumors affecting the brachial plexus are constant pain and dysesthesias. The pain is predominantly in the medial aspect of the arm, forearm and hand. (13)

Vasculitis

Systemic vasculitis can affect the blood vessels supplying nerves, and subsequently the blood flow to a nerve will be compromised causing neurologic dysfunction in the form of motor or sensory loss. The clinical symptoms associated with vasculitis affecting indirectly the plexus or nerve branch, is weakness or paralysis of a group of muscles supplied by a major nerve and radiating, burning or shooting pain associated with dysesthesias or numbness in a matching cutaneous distribution. (13)

Brachial neuritis

Personage-Turner syndrome is a viral infection of motor nerves causing weakness on the shoulder and on the arm. Pain is aggravated by arm movement, whilst neck motion or movements that would cause increase of the pressure in the intervertebral disc do not affect this pain. No specific therapy is effective for this disorder. (13)

Erb's Palsy

It is caused by injury mechanism and it affects the fifth and sixth cervical roots. It causes paralysis to m. deltoideus, m. biceps brachii, m. brachialis and brachioradialis, as well as, m. supraspinatus, infraspinatus and mm. rhomboidei. Other characteristic of this injury is that the arm hangs down and cannot be actively abducted or externally rotated, whilst the forearm cannot be flexed or supinated. This disorder occurs secondary to excessive traction of the arm. (13)

Dejerine-Klumpke Palsy

Causes of this syndrome are tumors, aneurysm of the aortic arch, fracture of the clavicle, fracture of the humerus, and traction of the arm. It affects the eighth cervical nerve root and the first thoracic, and subsequently causes paralysis to the flexors of the wrist, to the adductors and flexors of the thumb, and to the palmar and dorsal interossei. (13)

Thoracic outlet syndrome

It is a pathologic process that compresses the brachial plexus and subclavian vessels. Depending on the location of compression, the thoracic outlet syndrome has symptoms

associated with the anterior scalene syndrome, costoclavicular syndrome and hyperabduction syndrome. (13)

The anterior scalene syndrome is named after the compression it causes to the brachial plexus and to the subclavian artery between the anterior and medial scalene muscles and the first rib. Neurogenic symptoms include pain in the shoulder, arm, forearm, hand and fingers in a C8 and T1 distribution. Postural characteristic is the forward position of the head and shoulders. (13)

Costoclavicular syndrome occurs when compression of the subclavian artery and vein and brachial plexus between the clavicle and the first rib causes symptoms of vascular insufficiency. The symptoms of this syndrome are of vascular point and are characterized by claudication or edema. (13)

During the hyperabduction syndrome, symptoms of pain, paresthesias and numbness develop in the fingers and the hand. That is caused by stretching of the neurovascular bundle between the pectoralis minor tendon and the humeral head. (13)

Carpal tunnel syndrome

The median nerve in this syndrome is compressed under the flexor retinaculum in the wrist. This compression causes numbness in the palmar side of the thumb and the three medial fingers. Pain may spread proximally from the hand to the level of the shoulder. (2, 13)

Upper crossed syndrome

According to Vladimir Janda the imbalance between:

1. Weak lower and middle trapezius and, rhomboid, short upper trapezius and levator scapulae.
2. Weak deep neck flexors and short m. suboccipitals.
3. Weak m. serratus anterior and short pectoral group is a sign of upper crossed syndrome.

Symptoms of this syndrome include headache, neck pain and shoulder pain and temporomandibular pain (2)

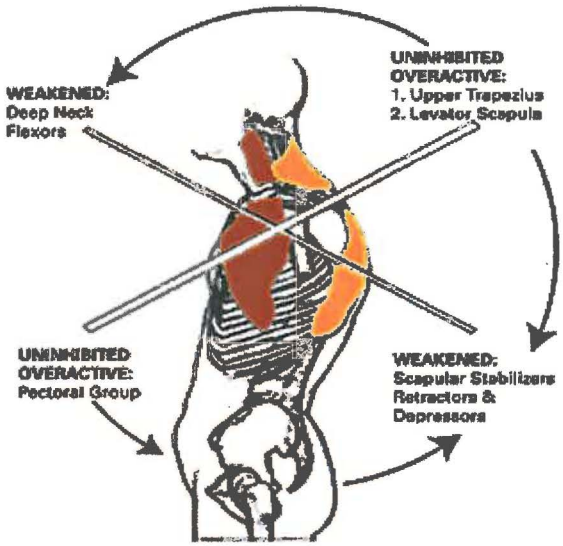

Figure 7(F7). Upper crossed syndrome.

Viscerogenic referred pain

Pain in the neck or in the shoulder may be caused due to abnormalities in organs that share segmental innervation with structures in the cervical spine. That means, impulses from visceral nerve endings arrive at the same reception point among the posterior horn cells as do impulses of somatic origin. These organs are the heart, thyroid, esophagus, gallbladder, stomach, lungs, pancreas and diaphragm. (2, 13)

Trigger points

An active myofascial trigger point causes a muscle not to reach its normal length, and weakens it. When a trigger point is compressed, within the patient's pain tolerance, it produces referred pain within its reference zone.

According to Travell and Simons, when referred pain from upper trapezius TrP overlaps with referred pain from myofascial TrP in sternocleodomastoideus, the resulting overlap can produce a typical tension-type headache. Also referred pain from the TrP on m. supraspinatus can be felt as deep ache in the mid-deltoid region of the shoulder and usually extends to the lateral epicondyle of humerus and also may extend to the wrist. (26)

Shoulder abnormalities

Instability, trauma, bursitis, rotator cuff lesions, and bicipital tendinitis are a partial list of

the lesions that affect the shoulder and causes pain over it. Referred pain from the shoulder may radiate proximally towards the base and lateral aspect of the neck. This radiation of the pain may be mediated through tension in the upper trapezius muscle. Also arthrosis of the glenohumeral and acromioclavicular joints can have symptoms of radiated pain. (2, 3, 8, 13)

2.12 Treatment

It is essential to always treat the primary cause with main aim on the general coordination. In this are involved the symptoms accompanying the disorder such as muscle spasm, joint blockages, and trigger points, lesions of muscles or their tendons and many more. Part of the main aim though is the correction of the functional abnormal position of the segments. (1, 15, 16, 17)

Acute state

Rehabilitation program:

The initial treatment should be focusing at reducing pain and inflammation. Treatment can begin with local icing, non-steroidal anti-inflammatory drugs, and reducing the forces compressing the nerve root by relative rest, avoiding positions that increase arm and/or neck symptoms, and manual traction. (10)

A cervical collar also can be used for patient comfort and some support. A cervical pillow at night can be helpful in maintaining the neck in a neutral position and limiting head positions, which cause narrowing of the neuroforamen. (10)

Manual traction can be used to reduce the pain and the symptoms by decreasing foraminal compression and intradiscal pressure.

Electrotherapy can be used in order to treat symptoms associated with the cervicobrachial causes. Physical therapy has a wide range of varieties according the symptomatology of the disease or disorders. Therefore, the choice must be the most effective one for the treatment required.

Other treatment:

Acupuncture has been used on cervicobrachial syndrome with some success. This can be if pain control is not achieved with physical therapy and medications or in conjunctions with these treatments. In addition, acupuncture can be tried instead of cervical epidural injections in patients who wish not to process with this procedure. (10)

Recovery phase

Rehabilitation program:

Once pain and inflammation are controlled, the patient's therapy should be progressed to restoration of full range of motion (ROM), and flexibility of the neck and shoulder girdle muscles.

Post isometric relaxation (PIR) technique can be used in order to remove trigger points and muscles spasms. Propioceptive neuromuscular facilitation (PNF) can be used to relax or strengthen the muscles.

Joint play mobilization and traction can remove the blockage of the joints. Various soft tissue techniques of the skin, connective tissue and fascia can be used.

Proper auto-therapy, depending on the postural imbalance, should be given to the patient in order to achieve the requirements of optimal posture or normal breathing pattern

Once the goal of gaining ROM and flexibility has been accomplished, attention should be given to the strengthening of the weak cervical muscles with isometric and concentric strengthening exercises. A thera-band is an appropriate device for this task in a single plane and includes flexion, extension, lateral bindings and rotation. In addition, the scapular stabilizing muscles including the m. trapezius middle & lower part, m.rhombodei, m. serratus anterior, and m. latissimus dorsi should be strengthened with progressive isotonic activity. All of those exercises should not be performed if pain is persisting throughout the process.

Surgical Interventions

Due to the broad spectrum of brachial plexus injuries, referring on all possible injuries, it is difficult to estimate the rate of spontaneous recovery. The potential for spontaneous recovery depends on the type and severity of injury. Therefore prognosis must be assessed for each patient individually based on the type and severity of their injury and the progression of any spontaneous recovery that may be occurring. (10, 23)

Serial physical examinations and diagnostic studies play a key role in tracking the progression of recovery. After a few months surgery is indicated if there is no recovery or if recovery has plateau at an unacceptable functional level. Surgical intervention serves two functions: confirmation of diagnosis and repair of injury. (10)

Maintenance phase

Patients should be independent in a stretching and strengthen program and continue with these exercises under supervision of a physiotherapist or an athletic trainer. Initially and then complete on their own, Emphasis is placed on stretching the anterior neck and shoulder muscles groups and strengthening the neck and scapular muscles. If completed correctly, proper head and neck positioning is then maintained in everyday activity and sports.

It also is important when dealing with the cervicobrachial syndrome not to ignore the lumbar and pelvic region. Lower body imbalances affect the overall posture and if left untreated would contribute to/or sustain an upper body postural disorder. Lewit states the most important imbalance in the lumbar and pelvic region is between weak gluteal muscles with hyperactive hip flexors and hyperactive lumbar erector spinal with weak abdominal muscles.

3. SPECIAL PART

Methodology

My practice was done at the Central Military Hospital for 2 weeks, from 4th until the 15th of February, 2008. I was practicing with Mrs. Alena Rihova and we decided to meet the patient 3 times per week, thus 6 times in a total. Each session lasted approximately 60 minutes. The patient agreed to the plan of the therapeutic sessions. An initial kinesiologic examination was done in order to determine the short and long terms of the rehabilitation plans. For the examination was used goniometer, while for the therapy, electrotherapy was applied, specifically Trabert current and Interferential currents. Further, post isometric relaxations, and ischemic pressure therapies, were applied in day to day therapies. Then a final kinesiologic exam was performed together with an evaluation of the therapy effect.

3.1 Anamnesis

Name: L.B, female

Year of Birth: 1938

Present medical Diagnosis: Cervicobrachial syndrome

Personal Anamnesis: Common childhood diseases

Family anamnesis:

- Her Father had low back pain
- Her mother was healthy

Medication: Citalec, Euthyrox, Concor.

Allergy anamnesis: Pollen allergy

Social anamnesis: She is married. She has 1 son and 2 daughters and they are all healthy

Vocational anamnesis: Not available

Hobbies-ADL: Lives in a house with stairs. She takes care of the house

Abuses: None

Operation anamnesis:

- In 1960 she had operation of L5-S1 because of disc herniation
- In 1978 she had operation of L4-L5,because of disc herniation

Current disease: The patient was sent from MuDr.Dagmar Navratilova to department of physiotherapy, at Central Military Hospital, because of pain at cervical spine propagating to upper right extremity. Also, during the night the patient has paresthesia on the right arm, and suffers from headaches. The problems appeared on November of 2007 while she was taking care of her mother in law, who was hospitalized.

Medical Documentation 29/01/08: The patient has hypertonus of musclulus trapezius bilateral, painful latero-flexion and rotation of the neck. Also, limited ante flexion and painful extension on the C-th crossing exists. There is also limited movement in thoracic spine. In 21st of January of 2008 she had X-ray.

Report of X-Ray: Flat cervical spine, osteochondrosis in the space of C6-C7 with narrowing of this moving segment. She also has dorsal osteophyts on the cervical spine.

Previous rehabilitation: No, this is the first time the patient attends physiotherapeutic treatment

Present status:

- Height:164cm
- Weight:63kg
- BMI: 24.20

She feels pain on right shoulder. In the night she wakes up from pain on the right shoulder and from headaches.

Differential Consideration

The patient does not have serious hereditary diseases according to the family anamnesis. According to the personal history, medical and laboratory investigations, the patient does not have any internal organs disease. Only orthopedic problems were presented. These problems were provoked, when the patient was taking care of her mother in law who was hospitalized.

Thus, there can be changes in muscle tone and muscle length, due to higher loading from the manual work, and from lifting loads. It is important to notice out that the patient is right handed, and the affected extremity is the right one. The problem may be caused from the stenosis of C6-C7. Also osteochondrosis in this moving segment can lead to spinal stenosis. The secondary cause could be as well the pain propagating to the upper right extremity from the cervical spine may be due to nerve root irritation.

3.2 Initial Kinesiologic Examination

3.2.1 Postural examination:

Table 3 (T3). *Anterior View*:

sole weight bearing	Symmetrical
Transversal sole arch	Flat
Longitudinal sole arch	Flat
Calf side	Symmetrical
Patella	Sinistra look medially, Dextra also look medially
Knees	Genua Valgus
Thigh contour	Symmetrical in both
Anterior superior Iliac spines	Elevation of the right side of the pelvis(lateral tilt)
Umbilicus	Is pulled downwards
Abdominals	Sinistra hypo tonus dextra hyper tonus
Sternum	Middle line
Nipples	Symmetrical
Clavicles	Symmetrical
Shoulder position	Right clavicle more elevated, dominant hand: right
Face	Symmetrical
Head position	Slight latero-flexion to the left

Table 4(T4). *Posterior View:*

Heel shape and position	Weight was on the medial side, round shape
Achilles' tendon contour	concave bilateral
Achilles' tendon thickness	Symmetrical
Calf	Symmetrical
Popliteal lines	On the same level and symmetrical
Thigh contour	Symmetrical medially and laterally
Subgluteal lines	Right side hypotonus
Superior posterior Iliac Spines	Elevated on the right side
Trunk outlines	Symmetrical
Spinous processes	On the level of thoracic spine 10 to 12 there is scoliosis dextra
Inferior scapula angles	Left elevated
Scapulas medial margins	Abduction sinistra
Scapula alata	Bilateral, positive
Shoulder position	Sinistra there is elevation of shoulder
Auricles	Greater distance dextra

Table 5(T5). *Side View:*

Head position	Ante flexion
Cervical lordosis	Hyper-lordosis
Cervico-thoracic	Vertebrae are prominent
Shoulder position	Protraction bilateral
Thoracic kyphosis	Flat
Lumbar lordosis	Flat
Pelvis position	Posterior tilt
knee joint position	Optimal

2 weight scale: on left side 33kg and on the right side 30 kg

Conclusion of the postural examination:

According to anterior view, the head lateral flexion to the left and the higher position of shoulder also to the left, lead me to test the shortness of upper trapezius, levator scapulae and palpate them for possible trigger points and higher tension. According the posterior view, the presence of abducted and winging scapula in both sides, lead me to test the muscle strength of m.rhombodei, m.trapezius (especially middle and lower part) and m.serratus anterior which are expected to be weak and palpate them for possible trigger points. According the side view, the forward head position will lead me to test the strength of neck flexors and palpation of neck extensors in order to check their tonus. The protraction of shoulders, bilaterally, will lead me to test the muscle length of pectoralis minor and major. Because the thoracic and the lumbar spines are flat and there is posterior tilt of the pelvis accompanied with hip extension, according to Kendall that is a flat back posture. According to Kendall elongated and weak will be the hip joint flexors, which will lead me to test the length and strength of these muscles, and short and strong will be the hamstrings.

3.2.2 GAIT examination:

- Step phase: symmetrical
- Stance phase: normal
- Pelvis rotation: yes
- Pelvis shift: yes
- Trunk movement: slight clock and counter-clock wise rotations
- Arm sinkinesis: very slight movement bilateral

Conclusion of GAIT examination:

Walking starts with heel strike phase, foot flat, heel off, good quality of toe off, knee bending is normal, pure and good quality of dorsal flexion, and return to heel strike phase again with the same rhythm and quality. The hyperextension of lower extremities in hip joint was eliminated – inhibition and weakness of gluteus maximus might be present.

3.2.3 Range Of Motion examination-Actively Performed:

Table 6(T6). *Head*:

Flexion: 40 degrees actively and passively performed

Extension: 15 degrees actively and passively performed

Active-right	Passive-right	Movements	Active-left	Passive-left
15 degrees	20 degrees	Lateral flexion	15 degrees	20 degrees
80 degrees	85 degrees	Rotation	80 degrees	85 degrees

Table 7(T7). *Shoulder Joint*:

Active-right	Passive-right	Movements	Active-left	Passive-left
165 degrees	170 degrees	Flexion	170 degrees	175 degrees
45 degrees	45 degrees	Extension	45 degrees	45 degrees
165 degrees	170 degrees	Abduction	170 degrees	175 degrees
0 degrees	0 degrees	Adduction	0 degrees	0 degrees
90 degrees	90 degrees	Horizontal Abd	90 degrees	90 degrees
40 degrees	40 degrees	Horizontal Add	40 degrees	40 degrees
5 degrees	5 degrees	Internal rotation	90 degrees	90 degrees
90 degrees	90 degrees	External rotation	90 degrees	90 degrees

Table 8(T8). *Elbow joint*:

Active-right	Passive-right	Movements	Active-left	Passive-left
130 degrees	135 degrees	Flexion	130 degrees	135 degrees
0 degrees	0 degrees	Extension	0 degrees	0 degrees

Table 9(T9). *Radio-ulnar joint:*

Active-right	Passive-right	Movements	Active-left	Passive-left
80 degrees	85 degrees	Supination	80 degrees	85 degrees
75 degrees	80 degrees	Pronation	75 degrees	80 degrees

Wrist:

- Flexion: 90 degrees dextra, 90 degrees sinistra
- Extension:85 degrees dextra,85 degrees sinistra

- Radial duction:25 degrees dextra,25 degrees sinistra
- Ulnar Duction: 35 degrees in both sides

Thumb:

- Flexion:15 degrees dextra,15 sinistra
- Extension: 65 degrees dextra an 70 sinistra
- Abduction: 55 degrees dextra,55 degrees sinistra
- Adduction: normal in both sides
- Opposition: it comes in contact with the small finger

MTC joints:

- Flexion: 90 degrees in both sides
- Extension:75 degrees in both sides

Interphalangeal joints:

- Flexion: 100 degrees bilaterally
- Extension: 0 degrees bilaterally

Conclusion of actively performed goniometry:

The range of motion (ROM) in the right shoulder joint is restricted in all directions, and mostly at internal rotation of the right shoulder. Also the range of motion of the head movements, latero-flexion and extension, are restricted.

3.2.4 Distances of Spine:

Table 10(T10)

Stibor's Distance	5cm (norm is 7-10)
Flesch De Forestier's Distance	1.5 cm distance between the occiput and the wall
Otto's Distance	32 cm in flexion, 27cm in extension and the difference between them two is 5 cm (normal finding is 4.5cm)
Thomayer's Distance	Normal
Latero-flexion	Sinistra 14cm, dextra 16cm (normal is 20cm)
Schober Distance	5cm (normal is 4-6cm)

Conclusion for the distances of spine: There is restricted movement in almost all distances. Only Thomayer's distance, and Schober distance are normal.

3.2.5 Neurologic Examinations:

Superficial sensation:

- Touch: normal at both upper extremities
- Tactile: normal at both upper extremities
- Dermatography: normal in both arms
- Hot: Without pathological findings, same sensation on arms
- Cold: Without pathological findings, same sensation on both arms

Deep sensation:

- Vibration: normal on both upper extremities
- Sensation of position: normal on both arms
- Sensation of movement: normal on both arms

Tendon Reflexes:

- Biceps brachii: negative, bilaterally
- triceps brachii: negative, bilaterally
- Radio-ulnar: negative, bilaterally
- Flexion of fingers: negative, bilaterally
- Patellar reflex: negative, bilaterally
- Achille's tendon reflex: negative, bilaterally

Reflexes:

- Babinski's reflex: negative on both sides
- Hoffman's reflex: negative on both sides
- Tromner's reflex: negative on both sides
- Juster's reflex: negative on both sides
- Rossolimo's reflex: negative on both sides
- Megazzini's reflex: negative on both sides
- Zukovski's reflex: negative on both sides
- Oppenheim's reflex: negative on both sides
- Vitek-Suma reflex: negative on both sides

Conclusion of the neurologic examination: The neurological examination of upper extremities bilaterally has negative findings. No neurological defects are present. The superficial sensation, deep sensation and the tendon reflexes are normal without pathological findings bilaterally.

3.2.6 Dynamic Tests:

- Vele test: negative
- Hautant test: negative
- Romberg's test: negative, in all three stages.
- Trendelemburg test: negative

Conclusion from Dynamic Tests: There are no positive results that can indicate muscular imbalance.

3.2.7Special Tests:

- Adson test :negative
- Wright test: negative

Conclusion from the special tests: The results show that there is not possible compression of the subclavian artery.

3.2.8 Isometric contractions against resistance:

- Internal rotation: positive, shoulder right side
- External rotation: negative, on both shoulders
- Abduction: negative, on both shoulders
- Adduction: negative, on both shoulders
- Biceps long head tendon test: positive, right side

Conclusion from isometric contractions against resistance:

Here we have one important finding, which may indicate some problem of lesion on the tendon of the long head of biceps brachii. Also the internal rotation is causing a painful condition when performed against resistance.

3.2.9 Basic Movement Patterns:

Extension in hip joint: Pathological sign: The motion starts with activation of lumbar erector muscles on contralateral side, and then ipsilateral lumbar spinae continues with contraction of gluteus maximus of the same, then contraction of hamstrings on the same side.

Abduction in hip joint: Physiological.

Trunk curls up: Pathological sign: Curling movement of the trunk is minimal and the movement performed with an almost straight back and anterior tilting of the pelvis. The movement performed by the hip joint than by kyphosis of the trunk.

Shoulder abduction: Pathological sign bilaterally: The movement starts with a great activity of m.trapezius, followed by deltoid and supraspinatus which are activated at the same time.

Push up: Pathological sign: During this test winging of the scapula occurs (Scapula alata) bilaterally.

Head Flexion: Pathological sign: The movement starts with protraction of head.

Conclusion of basic movement patterns:

Weakness of m.gluteus maximus was detected during hip extension basic movement pattern. There is also weakness of m. rectus abdominis, according to trunk curl up. There is over acting of m. sternocleidomastoideus, bilaterally, according to head flexion. During abduction of the shoulder, there is mostly action of m. trapezius. Weakness of m.rhombodei, m.serratus anterior, m.trapezius middle and lower part is visible, when the push up was performed.

3.2.10 Muscles Strength Tests According to F.P.Kendall:

Table 11, (T11). Strength tests

Dextra	Muscles	Sinistra
5	Upper Trapezius	5
4	Middle Trapezius	4
3	Lower Trapezius	3
3	rhomboideus	3
3	Serratus Anterior	3
5 4 5	Deltoideus Anterior Fibers Middle Fibers Posterior Fibers	5 4 5
There was intensive pain	Biceps Brachii	4
4	Triceps Brachii	4

Neck Flexors: Grade 4

Neck extensors: Grade 5

Neck Latero-flexors: Grade 5

Conclusion of the strength test examination:

Weakness of left m. deltoideus, m. biceps brachii, middle and lower part is noted. Weakness of m. trapezius in both sides, m. rhomboideus in both sides, m. serratus anterior in both sides is noted. There cannot be an evaluation for m. biceps brachii, right side, because the patient felt intense pain. There is slight weakness of the neck flexors.

3.2.11 Muscle Length Examination According to Janda:

Table12(T12). Length tests

Dextra	Muscles	Sinistra
1	Sternocleidomastoideus	1
1	Scaleni	1
2	Upper Trapezius	2
1	Pectoralis Major	1
2	Pectoralis Minor	2
2	Levator scapulae	2

Conclusion of Length examination:

There is severe shortening of m. upper trapezius on both sides, m. pectoralis minor on both sides, m. levator scapulae on both sides, and m. erector spinae on the cervicothoracal part bilaterally.

3.2.12 Palpation Examination:

Skin drag examination: During the examination of skin drug in cervical area, Hyperalgesic skin zones (HAZ) are found over the upper part of m. trapezius.

Connective tissue examination: During the examination of connective tissue in whole back and cervical area, restriction of the connective tissue over the upper part of m. trapezius is present.

Table 13(T13). Palpation examinations

Dextra	Muscles	Sinistra
	m. trapezius	
hyper tonus, TrP	upper part	hyper tonus, TrP
Normal tonus	middle part	Normotonus

Normal tonus	lower part	Normotonus
Normotonus	m. biceps brachii	Normotonus
Normotonus, TrP	m. sternocleodomastoideus	Normotonus
Hypertonus	m. scalenus, anterior part	Hypertonus
Hypertonus, TrP	m. levator scapulae	Hypertonus , TrP
Hypotonus	m. deltoideus	Normotonus
Hypertonus	m. pectoralis minor	Hypertonus
Hypertonus	m. pectoralis major	Hypertonus
Hypertonus	m. teres minor	Normotonus
Painful, hypertonus, TrP	m. supraspinatus	Normotonus
Hypertonus	m. infraspinatus	Normotonus
Hypertonus	m. subscapularis	Hypertonus
Hypotonus	m. gluteus maximus	Hypotonus
Hypertonus	m. erector spine	Hypertonus
Hypertonus	m. latisssimus dorsi	Hypertonus
m. rectus abdominis cranial part, bilaterally		Hypertonus
m. transversus abdominis		Hypotonus
m. oblique abdominis (internal & external), whole muscle		Hypotonus

Conclusion of Palpation examination:

According to these examinations hypertonicity exists in upper part of m. trapezius, m. levator scapulae in both sides, on m. pectoralis major and minor in both sides and in all the

rotator cuff muscles bilaterally. Trigger points are present over the upper part of m. trapezius, m. levator scapulae in both sides, and on right side of m. sternocleodomastoideus.

Hypotonicity exists on m. deltoideus in the left side, m. gluteus maximus in both sides and on mm. internus and externus obliques, on both sides.Hyperalgesic skin zones and restriction of the connective tissue are found over the upper part of m. trapezius.

3.2.13 Breathing Examination:

Inspiration: During inspiration the increase of transverse diameter is restricted. The lateral excursions of ribs are decreased. Also scalene muscles work more than they should be together with upper trapezius. The diaphragm does not descent enough. From the sequence of the inspiration the abdominal breathing and the lateral expansion of the ribs, are decreased and what predominates is the upper thoracic breathing.

Expiration: The examination indicates m. rectus abdominis overuse with decreased use of the transversal muscles.

Conclusion of breathing examination: The breathing examination indicates an upper thoracic breathing.

3.2.14 Joint Play Examination:

Table 14(T14). Joints that have been examined.

Atlanto-Occipital	No restriction
Cervical part of spine	No restriction
C-Th crossing	No restriction
Acromio-Clavicular joint	No restriction on both sides
Sterno-Clavicular joint	No restriction presents on both sides
Shoulder joint	No restriction on both sides
Scapulo-thoracic joint	No restriction on both sides
Ribs, upper part	No restriction on both sides

Elbow joint	No restriction on both sides
Wrist & (Carpal joint)	No restriction on both hands.

Conclusion of the Joint Play examination: It is visible that there is no restriction of any moving segment at any direction.

Conclusion of the Initial Kinesiologic Examination:

According to the results of every examination, we can distinguish some main problems, which may be responsible for the current situation of the patient. It should be analyzed the hyper tone of muscles, and specifically the upper part of m. trapezius, m. pectoralis major and minor, m. scalenus, anterior part, m. levator scapulae bilaterally, and of the muscles that consist the rotator cuff on right shoulder.

The hyper tone of the muscles referred above, is also visible in posture since they influence the position of the joints to which they are attached. Hence, they also influence the movement stereotypes, they overload the joints, and in combination with the upper thoracic breathing which increases the dysbalance between the muscles, lead the hypertonic muscles to the typical pattern of upper crossed syndrome.

Furthermore, the propagation of the pain to the upper extremity seems to be not of neurological origin, but has characteristics of referred pain from the muscle trigger points. Mainly the trigger points on upper part of m trapezius, bilaterally, the trigger points of m. sternocleidomastoideus, and trigger points on m. supraspinatus right side.

As mentioned before, the hyper tone occurring in most of the muscles around the right shoulder joint, together with the restricted range of motion of this joint in all directions, and mostly at internal rotation, can indicate some structural problems. But we are lacking of the information from the X-ray.

According the examination of reflexes, there is not lesion in the central nervous system, and the dynamic tests indicate no muscular or neural imbalance. The isometric resistance tests for the muscles of the rotator cuff, showed result of pain, when the patient was asked to hold against resistance for the movement of internal rotation of the right shoulder. That can also indicate, together with the result of the isometric resistance test, performed for the long head

of m. biceps brachii which is positive, some problem of lesion on the muscle or at the tendon of the long head of biceps brachii.

More postural imbalances are visible at the pelvic region, accompanied with wrong stereotypes in hip joint. The pelvis is in a posterior tilt and the lumbar spine is flat. The latter has been analyzed at the conclusion of the postural examination. Unfortunately, I did not have the time to focus on that area and make strength and length tests on the muscles surrounding the pelvic girdle. The same refers on the incorrect posture of the feet, and specifically on the flat transversal and longitudinal arches.

It would have been expected because of the hyper tone of the m. pectoralis major and minor, to find joint restriction on the upper ribs during the joint play examination. Instead the results indicate no restriction over those joints. The same refers to the joints of the cervical spine, where again no restriction was found. It is important to note this, since blockages on the cervical spine, thoracic spine, and over the ribs can cause pain and propagation of it over the shoulder, scapula and elbow.

3.3 Short term and long term rehabilitation plan

Short term: This will take place from the 4th of February to the 15th of February:

- Decrease the pain in the shoulder. To achieve that electrotherapy applied on the shoulder and ischemic pressure on the trigger points, together with post isometric relaxation.

- Release of the TrP over the m. trapezius on both sides, m. levator scapulae bilaterally, and on m. supraspinatus on the right side, by means of ischemic pressure and post isometric relaxation.
- Increase strength of the weakened neck flexors and lower stabilizers of the scapula with active contractions.
- Increase the range of motion both in neck and right shoulder by means of stretching.
- Instruction of the patient for correct breathing pattern
- Instruction of the patient for correct sitting posture
- Instruction of the patient for auto-therapy exercises.

Long term:

- Maintain the muscle power gained for the weakened muscles referred on the short rehabilitation plan.
- Maintain the range of motion of the neck and of the shoulder.
- Improve the coordination of muscles around the pelvis.
- Improve the posture, especially of the lower extremity.
- Improve the walking stereotype
- Improving the ADL

3.4 Rehabilitation

1st session, 04/02/08:

Subjective findings: The patient does not feel pain neither on the neck region, nor at the right upper extremity. She says that she feels pain on the right shoulder.

- Full kinesiologic examination
- Posture correction in sitting position according to Brugger
- PIR (post isometric relaxation) of m. trapezius upper part, m. levator scapulae, m. pectoralis minor, m. sternocleodomastoideus bilaterally.
- Active movement of neck retraction
- Active movement of lower and middle trapezius in order to increase strength
- Ischemic pressure on the trigger points of upper part of m. trapezius on both sides and of. Levator scapulae both sides
- Electrotherapy: Trabert current: f=143 Hz, monophasic, rectangular, pulse type current, impulse duration=2ms, pause= 5ms. Localization: one electrode was placed at the lower part of cervical spine and the other on the upper part of thoracic spine. This therapy was done for hyperemia and analgesia.

Notes: After the test for the long head of biceps tendon was performed, there was intensive pain, which indicates micro-trauma on the origin of the tendon. Therefore, to the next session's therapy it is recommended to the patient to follow electrotherapy of interferential currents. Also, when we applied the ischemic pressure treatment on the trigger point of the left upper trapezius, the patient started having headache. Therefore, this treatment was

stopped, instead PIR was induced and the there was relief of the headache. Further more, when therapy was applied on the trigger point of m. supraspinatus by means of ischemic pressure, the patient felt pain on the tip of the shoulder with radiation to the fifth finger of the right extremity. The neurologic examinations showed no paresthesia or other pathologic findings on upper extremities, that is the objective finding. The subjective finding is that the patient said that there is no paresthesia, but only pain on the tip of the shoulder accompanied sometimes with radiation to the right upper extremity, up to the small finger.

2nd Session, 06/02/08

Subjective finding: The patient feels fine. In the night she woke up 4 times because of pain on the right shoulder.

Objective finding: There is sticking pain when internal rotation is done passively on the right shoulder which can indicate degenerative changes in the joint. Also there is a lot of pain when the patient is asked to keep her elbow in flexion against resistance, and that can be due to micro trauma of the long head of biceps tendon.

- Posture correction in sitting position according to Brugger
- PIR (post isometric relaxation) of m. trapezius upper part, m. levator scapulae, m. pectoralis minor, m. sternocleodomastoideus bilaterally, and for biceps brachii (long head assists in flexion of shoulder).
- Active movement of neck retraction
- Active movement of lower and middle trapezius in order to increase strength
- Ischemic pressure on the trigger points of upper part of m. trapezius on both sides and of. Levator scapulae both sides and on TrP of m. supraspinatus right side.
- Electrotherapy: Trabert current: f=143 Hz, monophasic, rectangular, pulse type current, impulse duration=2ms, pause= 5ms. Localization: one electrode was placed at the lower part of cervical spine and the other on the upper part of thoracic spine. This therapy was done for hyperemia and analgesia.
- Electrotherapy: Interferential currents, amplitude modulation, bipolar application, f= 4000Hz, primary amplitude modulation= 80 Hz, spectrum= 40 Hz. The duration time= 10 minutes and the effect of the therapy aims to the strong analgetic effect. The intensity, over threshold sensitivity and the application was done so that one electrode

was placed on the ventral side of the shoulder and the other electrode on the dorsal side of the shoulder.

Auto-therapy:

- PIR of m. trapezius upper part, on both sides, in sitting position.
- PIR of m. levator scapulae, bilaterally, in sitting position.
- Active exercises for the neck flexors.
- Active movement of m. trapezius lower part and m. latissimus dorsi.
- Correct sitting according to Brugger.

Notes: When ischemic pressure was applied on the trigger point on the left upper trapezius, again the patient started having headache. The electrotherapy was performed on every following session.

Effect of the therapy: We relaxed and stretched m. upper trapezius on both sides, and m. levator scapulae.

3rd Session, 08/02/08

Subjective finding: The patient woke up in the night, 3-4 times because of pain on the right shoulder. The Pain does not radiate on the arm or forearm.

Objective finding: Trigger point on m. subscapularis, right side. When pressure is applied on this point the patient feels a lot of pain radiating to the right upper extremity until the elbow.

Therapy:

- PIR (post isometric relaxation) of m. trapezius upper part, m. levator scapulae, m. pectoralis minor, m. sternocleodomastoideus bilaterally, and for biceps brachii (long head assists in flexion of shoulder).
- Instruction, and re-education of the patient for correct breathing in order to relax the overloaded secondary muscles that are acting during the upper thoracic breathing, and activation of the main muscles of breathing.
- Active movement of neck retraction
- Active movement of lower and middle trapezius in order to increase strength
- Ischemic pressure on the trigger points of M. trapezius, upper part, on both sides. Also, on the trigger point of m. supraspinatus, on the right side.

Auto-therapy:

- PIR of m. trapezius upper part, on both sides in sitting position.
- PIR of m. levator scapulae, bilaterally, in sitting position.
- Active exercises for the neck flexors.
- Active movement of m. trapezius lower part and m. latissimus dorsi.
- Correct breathing pattern

Effect of the therapy: We relaxed and stretched m. upper trapezius on both sides, and m. levator scapulae. We released the trigger points on both sides of m. levator scapulae.

4th Session, 11/02/08:

Subjective finding: The patient felt good immediately after the last therapy, until the night when the pain started to appear and she was waking up from the pain.

Objective finding: The patient has pathological pattern of shoulder abduction and arm sinkinesis during gate was missing. There is still remaining stiffness of the muscles: m. trapezius upper part, m. levator scapulae, m. suboccipitals, mm. pectoralis major & minor.

Therapy:

- PIR: on m. trapezius upper part, m. levator scapulae, m. pectoralis major & minor, and m. sternocleodomastoideus bilaterally, mm. scaleni bilaterally.
- PNF- for both scapulas; isolated exercise of scapula according to *Adler* (training movements: anterior elevation, posterior depression, posterior elevation, anterior depression).
- Ischemic pressure on the trigger points of M. trapezius, upper part, on both sides. Also, on the trigger point of m. subscapularis, on the right side.
- PIR for the internal rotators of the right shoulder.

Auto-therapy:

- PIR of m. trapezius upper part, on both sides.
- PIR of m. levator scapulae, bilaterally.
- Active exercises for the neck flexors.
- Active movement of m. trapezius lower part and m. latissimus dorsi.
- Correct breathing pattern

Effect of the therapy: The patient felt relaxed on both shoulders, the arm sinkinesis during gate improved, but the patient has to think about it and train it and continue on keeping it.

5th Session, 13/02/08

Subjective findings: She felt much better from last session comparing to all the other sessions. According to the patient, she woke up two times during the night, and the intensity of pain compared with the other times was decreased significantly.

Objective findings: The hypertonus of the muscles still remains and the stereotype of abduction, flexion and internal rotation is still not optimal.

Therapy:

- PNF- for both scapulas; isolated exercise of scapula according to *Herman Kabat* (anterior elevation by technique slow reversal hold for serratus anterior, posterior depression by meaning of slow reversal hold for mm. rhomboidei and levator scapulae)
- PNF-with slow reversal hold technique, I. diagonal extension pattern for muscles (rhomboid major & minor, teres major).
- Ischemic pressure on the trigger points of M. trapezius, upper part, on both sides. Also, on the trigger point of m. subscapularis, on the right side.
- PIR for the internal rotators of the right shoulder.

Auto-therapy:

- PIR of m. trapezius upper part, on both sides.
- PIR of m. levator scapulae, bilaterally.
- Active exercises for the neck flexors.
- Active movement of m. trapezius lower part and m. latissimus dorsi.
- Correct breathing pattern

Effect of the therapy: Before we applied the second electrotherapy, the patient wanted to live because according to her she felt very good, so she did not want to continue with the therapy.

6th Session, 15/02/08:

Subjective findings: Last night she did not wake up and she did not have pain at the shoulder.

Objective findings: The trigger points of m. upper trapezius, on both sides where released, as well as the trigger point on m. subscapularis, right side. She feels pain when actively and passively performs internal rotation on the right shoulder.

3.5 Final kinesiologic examination

Present state: The patient feels a lot better after the therapeutic sessions we had together. According to the subjective information, she does not wake up often during the night, and if she does, the pain is not intense, as it was at the first session.

Postural examination:

Table 15 (T15) Anterior View:

sole weight baring	Symmetrical
Transversal sole arch	Flat
Longitudinal sole arch	Flat
Calf side	Symmetrical
Patella	Sinistra look medially Dextra also look medially
Knees	Genua Valgus
Thigh contour	Symmetrical in both
Anterior superior Iliac spines	Elevation of the right side of the pelvis(lateral tilt)
Umbilicus	Is pulled downwards
Abdominals	Sinistra hypo tonus dextra hyper tonus
Sternum	Middle line
Nipples	Symmetrical
Clavicles	Symmetrical
Shoulder position	**Normal position-improved**
Face	Symmetrical
Head position	**Normal position-improved**

Table 16 (T16) Posterior View:

Heel shape and position	Weight was on the medial side, round shape
Achilles' tendon contour	Concave bilateral
Achilles' tendon thickness	Symmetrical
Pooliteal lines	On the same level and symmetrical
Thigh contour	Symmetrical medially and laterally
Subgluteal lines	Right side hypotonus
Superior posterior Iliac Spines	Elevated on the right side
Trunk outlines	Symmetrical
Spinous processes	On the level of thoracic spine 10 to 12 there is scoliosis dextra
Inferior scapula angles	Left elevated
Scapulas medial margins	**Symmetrical-Improved**
Scapula alata	**Symmetrical-Improved** **Negative-Improved**
Shoulder position	Sinistra there is elevation of shoulder
Auricles	Greater distance dextra

Table 17 (T17) Side View:

Head position	**Slight-protraction-Improved**
Cervical lordosis	**Slight Hyper-lordosis, Improved**
Cervico-thoracic	Vertebrae are prominent
Shoulder position	**Slight protraction bilateral-Improved**
Thoracic kyphosis	Fat
Lumbar lordosis	Flat
knee joint position	Optimal

Two scale bearing: 33 dextra, 30 sinistra

GAIT examination:

- Step phase: normal
- Stance phase: normal

- Pelvis rotation: yes
- Pelvis shift: yes
- Trunk movement: slight clock and counter-clock wise rotations
- Arm sinkinesis: **movement bilateral-improved**

Range Of Motion examination-Actively and Passively Performed:

Table 18 (T18)Head:

Flexion: **45 degrees** actively and passively performed

Extension: **20 degrees** actively and passively performed

Active-right	Passive-right	Movements	Active-left	Passive-left
25 degrees	**30 degrees**	Lateral flexion	**25 degrees**	**30 degrees**
85 degrees	**85 degrees**	Rotation	**85 degrees**	**85 degrees**

Table 19(T19) Shoulder Joint:

Active-right	Passive-right	Movements	Active-left	Passive-left
175 degrees	**180 degrees**	Flexion	**175 degrees**	**180 degrees**
45 degrees	45 degrees	Extension	45 degrees	45 degrees
175 degrees	**180 degrees**	Abduction	170 degrees	175 degrees
0 degrees	0 degrees	Adduction	0 degrees	0 degrees
90 degrees	90 degrees	Horizontal Abd	90 degrees	90 degrees
40 degrees	40 degrees	Horizontal Add	40 degrees	40 degrees
10 degrees	**10 degrees**	Internal rotation	90 degrees	90 degrees
90 degrees	90 degrees	External rotation	90 degrees	90 degrees

Table 20 (T20) Elbow joint:

Active-right	Passive-right	Movements	Active-left	Passive-left
135 degrees	**140 degrees**	Flexion	130 degrees	135 degrees
0 degrees	0 degrees	Extension	0 degrees	0 degrees

Table 21(T21)Radio-ulnar joint:

Active-right	Passive-right	Movements	Active-left	Passive-left
80 degrees	85 degrees	Supination	80 degrees	85 degrees
75 degrees	80 degrees	Pronation	75 degrees	80 degrees

The rest of the range of motion examinations had the same results both in active and passive movements.

Wrist:

- Flexion: 90 degrees dextra, 90 degrees sinistra
- Extension:85 degrees dextra,85 degrees sinistra
- Radial duction:25 degrees dextra,25 degrees sinistra
- Ulnar Duction: 35 degrees in both sides

Thumb:

- Flexion:15 degrees dextra,15 sinistra
- Extension: 70 degrees dextra an 70 sinistra
- Abduction: 55 degrees dextra,55 degrees sinistra
- Adduction: 0 degrees in both sides
- Opposition: it comes in contact with the small finger

MTC joints:

- Flexion:,90 degrees in both sides
- Extension:75 degrees in both sides

Interphalangeal joints:

- Flexion: 100 degrees
- Extension: 0 degrees

Distances of Spine:
Table 22(T22) The distances of the spine

Stibor's Distance	5cm (norm is 7-10)
Flesch De Forestier's Distance	**0.5 cm distance between the occiput and the wall-improved**
Otto's Distance	32 cm in flexion, 27cm in extension and the difference between them two is 5 cm

	(normal finding is 4.5cm)
Thomayer's Distance	normal
Latero-flexion	sinistra 14cm, dextra 16cm (normal 20cm)
Schober Distance	5cm (normal is 4-6cm)

Neurologic Examinations:

Superficial sensation:

- Touch: normal in both sides
- Tactile: normal in both sides
- Dermatography: normal in both sides
- The above tests were done on both upper extremities

Deep sensation:

- Vibration: normal
- Sensation of position: normal
- Sensation of movement: normal
- Those tests were done on both upper extremities

Tendon Reflexes:

- Biceps brachii: negative
- triceps brachii: negative
- Radio-ulnar: negative
- Flexion of fingers: negative
- Patellar reflex: negative
- Achille's tendon reflex: negative
- Those tests were performed on the right and the left sides

Reflexes: were all negative

Dynamic Tests: Those tests were all negative

Isometric contractions against resistance:

- Internal rotation: positive, right side
- Biceps long head tendon test: positive, right side

Special Tests: were negative

Basic Movement Patterns:

Extension in hip joint: Pathological sign: The motion starts with activation of lumbar erector muscles on ipsilateral side, continues with contra lateral side, then activation of gluteal muscles and hamstrings appears, and at the end ThL erectors are activated.

Abduction in hip joint: Physiological.

Trunk curls up: Pathological sign: Curling movement of the trunk is minimal and the movement performed with an almost straight back and anterior tilting of the pelvis. The movement performed by the hip joint than by kyphosis of the trunk.

Shoulder abduction: Improved: m. supraspinatus, m. deltoideus and lastly the activation of m. upper trapezius.

Push up: Slight improvement: The scapula stabilizers were fixed. Scapula alata still exists.

Head Flexion: Improved: The head shifts normally forward and the neck follows.

Muscles Strength Tests According to F.P.Kendall:

Table 23(T23) Strength tests

Dextra	Muscles	Sinistra
5	Upper Trapezius	5
4	Middle Trapezius	4
4	Lower Trapezius	**4**
4	rhomboideus	**4**
3	Serratus Anterior	**4**
	Deltoideus	
5	Anterior Fibers	5
4	Middle Fibers	4
5	Posterior Fibers	5
There was intensive pain	Biceps Brachii	4
4	Triceps Brachii	4

Neck Flexors: Grade 4

Neck extensors: Grade 4

Neck Latero-flexors: Grade 5

Muscle Length Examination According to Janda:

Table 24 (T24) Length tests

Dextra	Muscles	Sinistra
1	Sternocleodomastoideus	1
0	Scalene	**0**

1	Upper Trapezius	**1**
0	Pectoralis Major	**0**
1	Pectoralis Minor	**1**
1	Levator scapulae	**1**

Palpation Examination:

Skin drag examination: **Improved**-In cervical area, there were no longer Hyperalgesic skin zones (HAZ) over the upper part of m. trapezius.

Connective tissue examination: **Improved**-During the examination of connective tissue in whole back and cervical area, there was no restriction of the connective tissue over the upper part of m. trapezius is present.

Table 25 (T25). Palpation over the muscles

Dx		**Sin**
	m. trapezius	
Normotonus No- TrP	upper part	**Normotonus No- TrP**
Normal tonus	middle part	Normotonus
Normal tonus	lower part	Normotonus
Normotonus	m. biceps brachii	Normotonus
Normotonus, **No TrP-improved**	m. sternocleodomastoideus	Normotonus
Normotonus,No-TrP-Improved	m. levator scapulae	**Normotonus,No-TrP-Improved**
Normotonus	m. deltoideus	**Normotonus-Improved**
Normotonus-Improved	m. pectoralis minor	**Normotonus-Improved**
Normotonus-Improved	m. pectoralis major	**Normotonus-Improved**
Normotonus-Improved	m. teres minor	Normotonus

Normotonus-Improved	m. supraspinatus	Normotonus
Hypertonus	m. infraspinatus	Normotonus
Normotonus	m. subscapularis	Hypertonus
Hypotonus	m. gluteus maximus	Hypotonus
Normotonus	m. erector spine	Normotonus
Normotonus	m. latisssimus dorsi	Normotonus

m.rectus abdominis, cranial part, bilaterally	Hypertonus
m. transversus abdominis	Hypotonus
m. oblique abdominis (internal & external), whole muscle	Hypotonus

Breathing Examination:

Inspiration: During inspiration the transverse diameter has increased. The lateral excursions of ribs have slightly improved, and the diaphragm descents more than before. From the sequence of the inspiration the abdominal breathing and the lateral expansion of the ribs, have been improved.

Expiration: The examination indicates still overuse of m. rectus abdominis.

Joint Play Examination: There was not any restriction at the initial kinesiologic examination

3.6 Therapy Effect Evaluation

According the final kinesiologic examination, improvements are visible. Specifically, improvement was visible:

- At the scapulae, the head and neck position during the posture examination.
- At the head flexion, shoulder abduction and push up, during the basic movement pattern examinations. The head flexion was performed chiefly by the deep neck flexors. The shoulder abduction started with activation of m. supraspinatus. The serratus anterior stabilized the scapula on the thorax during the push up.
- At all movements, of head, and left and right shoulder, the range of motion was improved.
- During the strength tests of right m. deltoideus, right m. biceps brachii, middle and lower part of m. trapezius (both sides), m. rhomboideus (both sides), m serratus anterior (both sides) and m. scaleni. All these muscles were strengthened.
- During the length tests for m. trapezius, upper part (both sides), m. pectoralis major and minor bilaterally, m. levator scapulae bilaterally and m. scalene on both sides. All of these muscles were elongated
- At the tonus of the muscles during the palpation examination. Also the TrP are not present at the time.
- The examination of skin and connective tissue shows that no HAZ and connective tissue shortness exist on the upper part of m. trapezius after the therapy.

4. PROGNOSIS

The state, for the particular diagnosis and problems, in this case improved in terms of relief of the pain in the shoulder joint. Also the headaches are no longer present after the therapy applied on the trigger points over the upper part of m. trapezius bilaterally. The range of motion was improved on the neck in all directions and the same is done at the shoulder joint. The patient will continue with the therapy and autotherapy with the same frequency. At the last session, I informed the physiotherapist, who would work with the same patient, about the examinations, the therapies and the results of those. Further, we discussed on what the focus should be during the next rehabilitation sessions. We expect a rehabilitation success.

The patient improved her stage due to her cooperation with the therapy, and her will and positive view over the current problem.

Due to the main problem and the medical doctor recommendation I concentrated on the cervicobrachial pain. Due to the lack of time I did not concentrate on the lumbar spine, on the pelvis, and lower extremity. The problem may arise from the lower part of the spine. Thus, it should be considered a deep stabilization system exam and therapy.

Lastly I would like to thank my patient Mrs. L.B. for her cooperation and positive mood. From the first session she showed will, and she cooperated with me during the therapy at the hospital, and during the autotherapy she was doing at home

5. CONCLUSION

The most important is that I proved that physiotherapy is an important field in medicine or so called a "medical allies". We are able to heal the patient after serious complications.

As well that we are able to reduce the pain that the symptoms or the syndrome gave the patient, through the physiotherapy and very importantly the psychological knowledge that we gain through our studies such as psycho-relaxation techniques.

Further more I would like to acknowledge that I was not able to re-heal totally the pathological syndrome or remove the pain due to the degeneration of the C5-C6 cervical spine and due to the stenosis. But I am glad that there was an improvement in the patient case as well improvement of the muscles and the stage.

It was very interesting the fact how the human body works, the therapeutic effect started and the patient start to feel better due to the psychological effect and that she is getting the treated, even though I am still a student, the patient still believed in me and she broke the barriers between me as a therapist and her as a patient. Especially with the pressure I was under due to my very first independent experience in a clinical procedure. I saw the improvement that the patient gained. In the 14 days the cervicobrachial syndrome was slightly better and the final kinesiological examinations showed that the patient improved. This kept me satisfied with the decision and the right treatment that I chose with thanks to my supervisor at the hospital and the supervisor at the school.

6. ABBREVIATIONS

1. Co: Occipital bone
2. C1: First cervical vertebra (atlas)
3. C2: Second cervical vertebra (axis)
4. C3: Third cervical vertebra
5. C6: Sixth cervical vertebra
6. C7: Seventh cervical vertebra
7. C8: Eighth cervical vertebra
8. C/T: Cervicothoracic
9. m: Muscle
10. M: Muscle
11. ROM: Range of motion
12. BMI: Body Mass Index
13. TrP: Trigger point
14. PIR: Post Isometric Relaxation
15. Abd: Abduction
16. Add: Adduction

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1. F5, 7

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10. APPENDIX

Muscles acting at the neck

M. Sternocleodomastoideus	Medial or sternal head: Cranial part of manubrium sterni Lateral or clavicular head : Median one third of clavicle	Lateral surface of mastoid process, lateral one half of superior nuchal line of occipital bone	Acting bilaterally flexes and extends the head, and acting unilaterally laterally flexes and rotates to opposite side the head
M. Rectus capitis posterior major	Spinous process of axis	Lateral portion of occipital bone below inferior nuchal line	Extension of head; rotation of face to same side
M. Rectus capitis posterior minor	Spinous process of atlas	Medial portion of occipital bone below inferior nuchal line	Extension of head
M. Oblique capitis superior	Transverse process of atlas	Occipital bone between superior and inferior nuchal lines	Extension of head and bends it to same side
M.Oblique capitis inferior	Spinous process of axis	Transverse process of atlas	Rotation of face to same side
M.Longus colli	Superior oblique portion: Transverse processes of third to fifth cervical vertebrae Inferior oblique portion: Anterior surface of bodies of first two or three thoracic vertebrae Vertical portion Anterior surface of bodies of first three thoracic and last three cervical vertebrae	Tubercle on anterior arch of atlas Anterior tubercles of transverse processes of fifth and sixth cervical vertebrae Anterior surface of bodies of second, third and cervical vertebrae	Flexes the head, laterally flexes and rotates it to the same side

M.Longus capitis	Anterior tubercles of transverse processes of third through sixth cervical vertebrae	Inferior surface of occipital bone	Acting bilaterally flexes the head Acting unilaterally rotates the head to the same side
M.Rectus capitis anterior	Root of transverse, and anterior surface of atlas	Inferior surface of occipital bone	Acting bilaterally flexes the head Acting unilaterally rotates the head to the same side
M.Platysma	Fascia covering superior parts of Pectoralis Major and Deltoid	Inferior margin of mandible, and skin of lower part of face and corner of mouth	Flexes the head
M.scalenes Anterior Medius Posterior	Anterior tubercles of transverse processes of third to sixth cervical vertebra Posterior tubercles of transverse processes of second through seventh cervical vertebrae Posterior tubercles of transverse proceses of last two or three cervical vertebrae.	Scalene tubercle and cranial crest of first rib Cranial surface of first rib between tubercle and subclavian groove Outer surface of second rib	Acting bilaterally flexes the head. Acting unilaterally laterally flexes and rotates the head to the opposite side Acting unilaterally laterally flexes and rotates the head to the opposite side Acting unilaterally laterally flexes and rotates the head to the opposite side
Erector spinae (superficial) Iliocostalis lumborum/Spinal	Common origin from anterior surface of broad tendon attached to medial crest of the sacrum, spinous	By tendons ito inferior borders of angles of lower six or seven rib	Extension of vertebral column in lower thoracic area; draws ribs downward.

	processes of lumbar 11^{th} and 12^{th} thoracic vertebrae, posterior part of medial lip of iliac crest, supraspinous ligament, and lateral crests of sacrum		
Iliocostalis thoracis/Spinal	By tendons from upper borders of angles of lower six ribs	Cranial borders of angles of upper six ribs and dorsum of transverse process of seventh cervical vertebra.	Extension and lateral flexion of vertebral column in upper thoracic area; draws ribs downward.
Iliocostalis cervicis/Spinal	Angles of third through sixth ribs	Posterior tubercles of transverse processes of fourth through sixth cervical vertebrae	Extension of vertebral column in upper thoracic and lower cervical areas.
Longissimus thoracis/Spinal	In lumbar region, blended with iliocostalis lumborum, posterior surfaces of transverse and accessory processes of lumbar vertebrae, and anterior layer of thoracolumbar fascia	By tendon into tips of tranverse processes of all thoracic vertebrae and by fleshy digitations into lower 9 or 10 robs between tubercles and angles	Extension and lateral flexion of vertebral column in thoracic area; draws rib downward.

Longissimus cervicis/Spinal	By tendons from transverse processes of upper four or five thoracic vertebrae	By tendons into posterior tubercles of transverse processes of second through sixth cervical vertebrae	Extension and lateral flexion of vertebral column in cervical area; draws rib downward.
Longissimus capitis/Cervical	By tendons from transverse processes of upper four or five vertebrae and articular processes of lower three or four cervical vertebrae	Posterior margin of mastoid process deep to splenius capitis and sternocleidomastoid	Extension, lateral flexion and rotation of cervical spine; turning the head to face toward the same side.
Spinalis thoracis/Spinal	By tendons from spinous processes of first two lumbar and last two thoracic vertebrae	Spinous processes of upper four to eight (variable) thoracic vertebrae	Extension of vertebral column in thoracic area
Spinalis cervicis/Spinal	Ligamentum nuchae, lower part; spinous process of seventh cervical vertebra	Spinous process of axis and, occasionally, into the soinous processes of C3 and C4	Extension of vertebral column in upper cervical area.

Muscles connecting the upper limb to the vertebral column

Name	Origin	Insertion	Function	innervations
Trapezius	Medial third of superior nuchal line, ligamentum nuchae, spinous processes of C7 to T12 vertebrae	Lateral third of clavicle, acromion and spine of	Upper fibers elevate, middle fibers adduct the scapula	Cranial nerve XI, and C3 and C4

	and lumbar and sacral spinous processes	scapula	and rotate it so that the inferior angle internally rotate. The lower fibers depress the scapula	
Latissimus dorsi	Spinous processes of the inferior six thoracic vertebrae, Thoracolumbar fascia, iliac crest and inferior 4 ribs	Floor of intertubercul ar groove of humerus	Extends, adducts and medially rotates humerus	Thoracodorsal n. C6, C7, C8
Levator scapulae	Posterior tubercles of transverse processes of C1-C4 vertebrae	Superior part of medial border of scapula	Elevates scapula and tilts its glenoid cavity inferiorly by rotating scapula	Dorsal scapular. C4 and C5
Rhomboid minor and major	Minor: Ligamentum nuchae and spinous processes of C7 and T1 vertebrae Major: Spinous processes of T2 to T5	Medial border of scapula	Adducts the scapula and externally rotates the inferior angle	Dorsal scapular n. C4 and C5

Muscles acting at the shoulder girdle

Dorsal Muscle Group

Name	Origin	Insertion	Function	Innervations
Supraspinatus	Supraspinous fascia	Upper Greater tubercle	Holds humerus in socket	Subscapular nerve – C4-C6

	Supraspinous fossa		Tenses scapula Abducts the arm	
Infraspinatus	Infraspinous fossa Spine of scapula Infraspinous fascia	Middle Greater tubercle	External rotation of arm Reinforces capsule of shoulder joint	Suprascapular nerve – C4-C6
Teres Minor	Lateral border of scapula	Lower Greater tubercle	Lateral rotator of arm	Axillary nerve – C5-C6
Deltoid	Clavicular – lateral 1/3 clavicle Acromial – acromion Spinal – lower spine of scapula	Deltoid tuberosity	Abductor of shoulder joint	Axillary nerve – C4-C6 Clavicular fibers – pectoral branches – C4-C5
Subscapularis	Subscapular fossa	Lesser tubercle	Internal rotation of arm	Subscapular nerve – C5-C8
Teres Major	Lateral scapula	Lesser tubercle	Retroversion of arm Adduction (secondary)	Thoracodorsal nerve – C6-C7
Latissimus Dorsi	Vertebral – Spinous process of 7th-12th thoracic vertebrae Iliac – Thoracolumbar fascia Costal – 10th-12th ribs Iliac – Posterior iliac crest	Lesser Tubercle	Lowers raised arm Abducts arm Together – pull shoulders backward and downward Forced expiration (coughing muscle)	Thoracodorsal nerve – C6-C7

Ventral Muscle Group

Name	Origin	Insertion	Function	Innervations
Coracobrachialis	Coracoid process	Medial humerus	Anteversion of arm Holds head of humerus in socket	Musculocutaneous nerve – C6-C7
Pectoralis Minor	3rd-5th ribs	Coracoid process	Lowers and rotates scapula	Pectoral nerves – C6-C8
Pectoralis Major	Clavicular – medial anterior clavicle Sternocostal – sternal membrane and cartilages 2nd-6th ribs Abdominal – upper rectus sheath	Greater tubercle	Lower raised arm Adduct arm and rotate immediately Clavicular and sternal parts can produce anteversion Sternocostal and abdominal parts lowers shoulder anteriorly	Pectoral nerves – C5-T1

Muscles acting at the arm

Ventral Muscle Group

Name	Origin	Insertion	Function	Innervations
Brachialis	Distal anterior humerus	Ulnar tuberosity	Flexor of elbow joint	Musculocutaneous nerve – C5-C6

	Intermuscular septa	Joint capsule		
Biceps Brachii	Long head – supraglenoid tubercle Short head – coracoids process		Long head – abducts arm, rotates medially Short head – adductor Both heads – anteversion shoulder joint Flexor and supinator of elbow	Musculocutaneous nerve – C5-C6

Dorsal Muscle Group

Name	Origin	Insertion	Function	Innervations
Triceps Brachii	Long head – infraglenoid tubercle of scapula Medial head – groove of radial nerve, dorsal humerus, medial intermuscular septum Lateral head – dorsal humerus	Olecranon of ulna Posterior wall of capsule	Extension of elbow joint At shoulder the long head is involved in retroversion and adduction of arm	Radial nerve – C6-C8
Anconeus	Dorsal lateral epicondyle Radial collateral ligament	Proximal dorsal ulna	Assist triceps brachii in production of extension	Radial nerve – C7-C8

Muscles acting at the forearm Ventral Muscle

GroupSuperficial layer

Name	Origin	Insertion	Function	Innervations
Pronator Teres	Humeral head – medial epicondyle of humerus, medial intermuscular septum Ulnar head – coronoid process of ulna	Pronator tuberosity of radius	Pronates arm Flexion at elbow joint	Median nerve – C6-C7
Flexor Digitorum Superficialis	Humeral head – medial epicondyle of humerus Ulnar head – coronoid process of ulna Radial head - radius	Center of middle phalanx 2^{nd}-5^{th} finger	Flexor of wrist Flexor of fingers Weak flexor of elbow	Median nerve – C7-T1
Flexor Carpi Radialis	Medial epicondyle of humerus	Palmar surface 2^{nd} metacarpal	Radial abduction with Extensor Carpi Radialis Weak flexor and pronator of elbow Palmar flexion	Median nerve – C6-C7
Palmaris Longus	Medial epicondyle humerus	Palmar aponeurosis	Flexes hand towards palm Tenses palmar aponeursis	Median nerve – C7-T1
Flexor Carpi	Humeral head –	Pisiform bone	Palmar flexion	Ulnar nerve –

Ulnaris	medial epicondyle of humerus Ulnar head – olecranon, posterior margin ulna	Pisohamate lig – extends hamate Pisometacarpal lig – extends 5th metacarpal	Ulnar adduction	C7-C8

Deep Layer

Name	Origin	Insertion	Function	Innervations
Pronator Quadratus	Distal palmar surface ulnae	Distal palmar surface radius	Pronates forearm	Median nerve – C8-T1
Flexor Digitorum Profundus	Proximal 2/3 palmar surface ulnae Interosseus membrane	Base of terminal phalanx 2nd-5th fingers	Flexor of wrist Flexor of metacarpal Flexor of MCP Flexor of phalangeal	Median nerve – C7-T1 Ulnar nerve – C7-T1
Flexor Pollicis Longus	Anterior radius Interosseus membrane	Base terminal phalanx of thumb	Flexor of thumb Little abduction radialy	Median nerve – C7-C8

Radial Muscle Group

Name	Origin	Insertion	Function	Innervations
Ext. Carpi Radialis Brevis	Lateral epicondyle of humerus Radial collateral ligament Anular radial ligament	Base of 3rd metacarpal	Midposition from ulnar abduction Flexes dorsally Weak flexor of elbow	Radial nerve – C7

Ext. Carpi Radialis Longus	Lateral supracondylar crest humerus Lateral intermuscular septum	Base of 2nd metacarpal	Weak flexor of elbow Weak pronator Supinator in stretched arm, Dorsiflexion of carpal joints Radial abduction	Radial nerve – C6-C7
Brachioradialis	Lateral supracondylar crest humerus Lateral intermuscular septum	Radial styloid process ulnae	Supination of forearm Flexion of forearm	Radial nerve – C5-C6

Dorsal Muscle Group

Superficial Layer

Name	Origin	Insertion	Function	Innervations
Extensor Digitorum	Lateral epicondyle of humerus Radial collateral ligament Anular radial ligament Antebrachial fascia	Bases of proximal phalanx Capsules of MCP joints	Dorsiflexor of wrist and metacarpal joints Extends and spreads fingers Ulnar abductor	Radial nerve - C6-C8
Extensor Digiti Minimi	Together with Extensor Digitorum	Dorsal aponeurosis 5th finger	Extends 5th digit Dorsiflexion hand Ulnar duction of hand	Radial nerve C6-C8

Extensor Carpi Ulnaris	Common head with Extensor Digitorum Ulna	Base of 5th metacarpal	Ulnar abductor	Radial nerve – C7-C8

Important Respiratory muscles

Muscle	Origin	Insertion	Function
Diaphragm	The xiphoid process of sternum, the costal margin of the thoracic wall, the ends of ribs XI and XII, ligament that span across structures of the posterior abdominal wall, vertebrae of the lumbar region	To a central tendon (thin strong aponeurosis with no bony attachment)	Separates the thoracic and abdominal cavities. During inspiration contracts and descents. During expiration diaphragm relaxes and ascends decreasing the volume of thoracic cavity
External Intercostals	Inferior margin of rib above	Superior surface of rib below	Most active during inspiration; support intercostals space; move ribs superiorly
Internal intercostals	Lateral edge of costal groove of rib above	Superior surface of rib below deep to the attachment of the related external intercostal	Most active during expiration; support intercostals space; move ribs inferiorly

PHOTOGRAPHS PATIENT

Photograph (1). The patient is standing upright

Photograph (2). The patient actively performs internal rotation

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Application for Opinion of UK FTVS Ethic Committee

On the project of Bachelor Thesis including human participants

Title: CERVICOBRACHIAL SYNDROME

Project form: Bachelor Thesis

Author; (crucial author) FRAGKISKOS BON

Supervisor (in case of student project) Mgr. A. KACZMARSKA

Project description

The case report of rehabilitation the patient with anamnesis .....elaborated with the vocational sight of physiotherapist in ..... ústřední vojenská nemocnice ..... (Health care unit)

No one invasive procedure will be applied.

Proposal of Agreement (enclosed)

Prague 4/2/08 Author's signature Fragkiskos Bon

Statement UK FTVS Ethic Committee

Committee members: Ass. Prof. Staša Bartůňková, M.D., CSc.
Prof. Ing. Václav Bunc, CSc.
Prof. PhDr. Pavel Slepička, DrSc
Ass. Prof. Jan Heller, MD., CSc.

The project was authorized by Ethic Committee UK FTVS with reference number: 0040/2008

Date: 22. 2. 2008

Ethic Committee UK FTVS evaluated submitted project and found no discrepancy to valid principles, instructions and international guidelines for biomedical research, including human participants.

Author of project fulfilled necessary conditions for the agreement of Ethic Committee.

Faculty stamp

Signature of EC chairman

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