Faculty of Physical Education and Sport UK, Prague
Department of Physiotherapy

UPPER CROSSED SYNDROME

Bachelor thesis

Author: Apeslidis Theodoros **Supervisor: Mgr Miroslava Jalovcova**

March 2007, Prague **Adviser: Marie Musílková**

Declaration

I declare that this Bachelor Thesis has been based entirely on my own individual work and on my own practice that took place in Vojenska Nemocnice in Prague from 22/1/2007 to 2/2/2007. 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 Apeslidis Theodoros

Acknowledgement

During my life there were a lot of people that affected my decisions and helped me and I would like to thank all of them.

First of all the most important people for the formation of my personality is my family. I would like to thank them for the wise guiding during my childhood and the important advises in every serious decision of my life. They were always standing in my side whatever my decisions were. As everybody does I did a lot of mistakes in my life, but my parents always supported me. They wanted me to take my life lesson and learn how to react and behave in every situation by learning through my mistakes. Furthermore, they gave me the appropriate education so that at the end of high school I would be able to choose what I like for my future profession. When I took the decision that this profession is physiotherapy they wanted me to join one o the best universities in Europe so that I would fulfill my dreams in a perfect way.

However, I would probably never take this decision without the advice of a good friend and amazing physiotherapist Mr Ioannis Karambelas. He was the first person who believed in my power for being a professional physiotherapist. I would like to thank him also for the knowledge that gave me during my practice in the Spa of Edipsos where he was the physiotherapy manager.

I want also to thank the professors of Charles University in Prague. Their passion for physiotherapy, their great work in the classes and the knowledge that they shared with the students made me love even more this profession. I appreciate the great effort of the whole department of Physiotherapy.

I want to thank the physiotherapist Mrs. Marie Musilkova, my adviser during the fourteen days practice in Vojenska Nemocnice. She is a skillful physiotherapist with plenty of knowledge. She was really helpful to all the students during the practice and she gave us the confidence and guidance to work independently with our patients. I want to thank also the other physiotherapists in Vojenska Nemocnice for the help and cooperation during my practice.

Finally, I want to help the physiotherapist Mgr Miroslava Jalovcova, my supervisor in my bachelor thesis. I feel lucky that I had the honor to be a student of her during the three years of my bachelor degree. She is an amazing person and a great physiotherapist. Her special way of teaching and thinking made the students to think

deeper about the physiotherapy problems and not looking only the surface of a problem. She still remains the idol for our profession.

Theodoros Apeslidis

In Prague, March 2007

Contents:

1. Preface

During my childhood till my high school age I used to deal with a lot of sports. In these sports plenty of injuries usually happened. That was the first time that I understood that I wanted to treat people with injuries. But I did not have the knowledge and the skills at that moment. After my studies here in Prague the university gave this knowledge to treat not only people with injuries but a variety of diseases, syndromes or problems.

In my thesis I will try to give you an example how I practically use all of these knowledge for a syndrome that is very often nowadays. That is, I will show you a complete session of therapy units including evaluation, examination, inclusions that connect them to the therapeutic plan, and the execution of a therapy proposal with its effect on the patient's rehabilitation program.

2. List of Abbreviations

1) IV: Intervertebral
2) L5: fifth lumbar vertebra
3) T4: fourth thoracic vertebra
4) Co: occipital bone
5) C1: first cervical vertebra (atlas)
6) C2: second cervical vertebra (axis)
7) C3: third cervical vertebra
8) C6: sixth cervical vertebra
9) C7: seventh cervical vertebra
10) TH12: twelfth thoracic vertebra
11) UCS: Upper crossed syndrome
12) TMJ: Tempomandibular joint
13) SCM: Sternocleidomastoid muscle
14) HAZ: Hyperalgic zones
15) ROM: Range of motion
16) BMI: Body Mass Index
17) TrP: Trigger point
18) PIR: Post Isometric Relaxation
19) PFS: Post Facilitation Stretching
20) C/T: Cervicothoracic
21) m: muscle
22) M: muscle

3. Abstract

Title: Upper crossed syndrome

Thesis Aim: In this thesis I will discuss about the upper crossed syndrome as defined by Janda and show my results after five therapeutic sessions with one patient that had most of the signs of the UCS.

Clinical findings: This patient is a 24 year student that works at the same time as secretary. She has headaches with increased frequency last months and feels the stiffness of the neck after the work. According to the examination muscle imbalances were detected with the most important this one between the week deep neck flexors and the short suboccipital muscles. Also joint play restrictions existed in the cervical spine at the Co-C1 articulation and C/T junction. Trigger points in several muscles (e.g upper trapezius, levator scapulae etc) and muscle shortness (marked of suboccipital muscles) and ROM restriction of head movements were also detected.

Methods: The therapy included five 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 five sessions improvements were detected in the final kinesiologic examination. Shortened muscles were elongated, hypertonic muscles were relaxed, restricted ROM of shoulder joint an head were increased, blockages of joint play in cervical spine and C/Th crossing were mobilized, strength of muscles around scapula and cervical spine was improved. Results of my treatment approach, discussions of the upper crossed syndrome and literature approaches for the examination and treatment of the upper crossed syndrome are discussed.

Key words: Upper crossed syndrome, muscle imbalances, cervicogenic headache

4. General part

4.1 Anatomy of Vertebral Column

4.1.1 The Vertebral Column

The vertebral column (figure 1) is a flexuous and flexible column, formed of a series of bones called vertebræ.

The vertebræ are thirty-three in number, and are grouped under the names cervical, thoracic, lumbar, sacral, and coccygeal, according to the regions they occupy; there are seven in the cervical region, twelve in the thoracic, five in the lumbar, five in the sacral, and four in the coccygeal.

This number is sometimes increased by an additional vertebra in one region, or it may be diminished in one region, the deficiency often being supplied by an additional vertebra in another. The number of cervical vertebræ is, however, very rarely increased or diminished.

The vertebræ in the upper three regions of the column remain distinct throughout life, and are known as true or movable vertebræ; those of the sacral and coccygeal regions, on the other hand, are termed false or fixed vertebræ, because they are united with one another in the adult to form two bones—five forming the upper bone or sacrum, and four the terminal bone or coccyx.

With the exception of the first and second cervical, the true or movable vertebræ present certain common characteristics which are best studied by examining one from the middle of the thoracic region. [4]

4.1.2 Curves of Vertebral column

Viewed laterally the vertebral column presents several curves, which correspond to the different regions of the column, and are called cervical, thoracic, lumbar. The cervical curve, convex forward, begins at the apex of the odontoid (tooth-like) process, and ends at the middle of the second thoracic vertebra; it is the least marked of all the curves. The thoracic curve, concave forward, begins at the middle of the second and ends at the middle of the twelfth thoracic vertebra. Its most prominent point behind corresponds to the spinous process of the seventh thoracic vertebra. This curve is known as a kyphotic curve.

The lumbar curve is more marked in the female than in the male; it begins at the middle of the last thoracic vertebra, and ends at the sacrovertebral angle. It is convex anteriorly, the convexity of the lower three vertebrae being much greater than that of the upper two. This curve is described as a lordotic curve. [4]

- The primary carvature of the vertebral column is concave anteriorly, reflecting the original shape of of the embryo and is retained in the thoracic and sacral regions in adults[20]
- Secondary carvatures, concave posteriorly, form in the cervical and lumbar regions and bring the center of gravity into a vertical line, which allows the body's weight to be balanced on the vertebral column in a way that expends the least amount of muscular energy to maintain upright bipedal stance. [10]

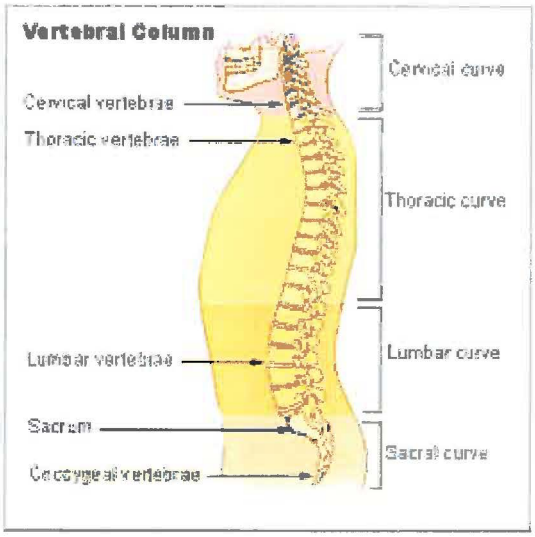


Figure 1. Vertebal column (lateral view) [4]

4.1.3 Structure and Function of Vertebrae

Vertebrae vary in size and other characteristics from one region of the vertebral column to another and to a lesser degree within each region. A typical vertebra consists of:

- A vertebral body
- A vertebral (neural) arch
- Seven processes

Typical vertebrae vary in size and characteristics from one region to other; however, their basic structure is the same.

The Vertebral body (figure 2) is the anterior, more massive part of the bone that gives strength to the vertebral column and supports body weight. The vertebral bodies, especially from T4 inferiorly, become progressively larger to bear the progressively greater body weight. In dried laboratory and museum skeletal specimens, the hyaline cartilage that covers most of the superior and inferior ends of the vertebral body is absent and the bone appears spongy, except at the periphery where an epiphyseal ring of smooth bone- the epiphyseal ring (derived from the annular epiphysis) – fused to the body. As the vertebrae grow, the hyaline epiphyseal plates form the zone from which the vertebral body grows in height. The epiphyseal growth plates, in addition to serving as growth zones, probably provide some protection to the vertebral bodies and permit the diffusion of fluid between IV disc and the capillaries in the vertebral body. A secondary center of ossification appears around puberty in the margin of each growth plate- forming an epiphyseal ring from the annular epiphysis. [15]

The Vertebral arch (figure 2) is posterior to vertebral body and is the part of the vertebra that is formed by the right and left pediclesand the laminae. The pedicles are short, stout processes that join the vertebral arch to the vertebral body. The pedicles project posteriorly to meet two broad, flat plates of bone- the laminae. The vertebral arch and the posterior surface of the vertebral body form the walls of the vertebral foramen. The succession of the vertebral foramina in the articulated column forms the vertebral canal (spinal canal), which contains the spinal cord, meninges, fat, spinal nerve roots, and vessels. The vertebral notches are indentations formed by projection of the body and articular processes above and below the pedicle. The superior and inferior vertebral notches of adjacent vertebrae contribute to the formation of

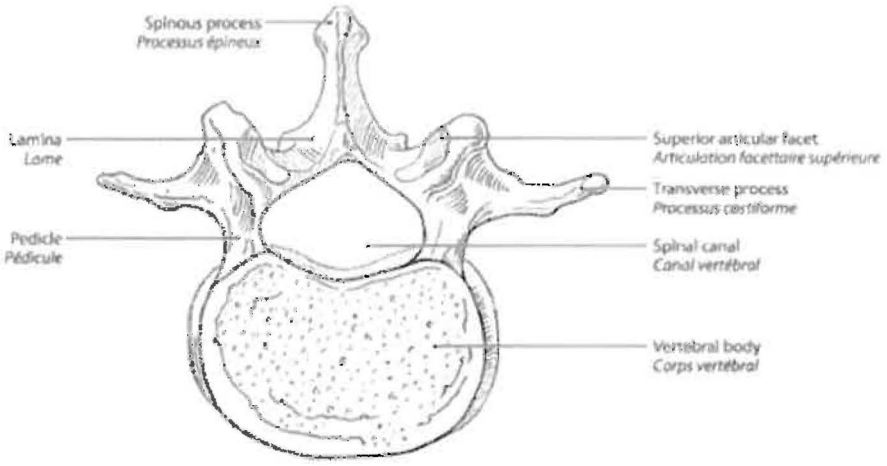
intervertebral foramina, which gives passage to spinal nerve roots and accompanying vessels, and contain the spinal ganglia (dorsal root ganglia). [15]

Seven processes arise from the vertebral arch of a typical vertebra

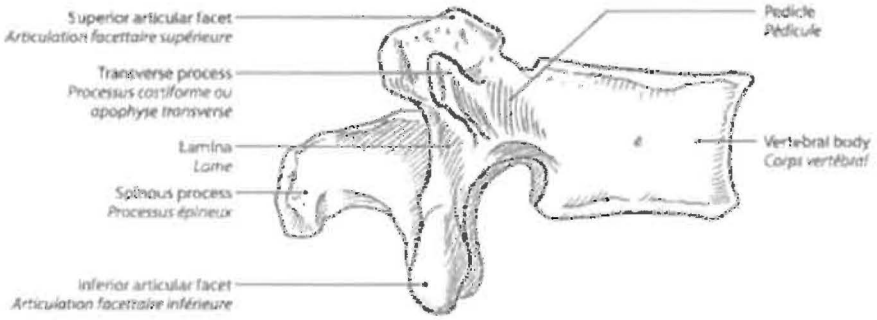
- A spinous process that projects posteriorly from the vertebral arch at the junction of the laminae and overlaps the vertebra below
- Two transverse processes project posterolaterally from the junctions of the. pedicles and laminae
- Four articular processes – two superior and two inferior- also arise from the junctions of pedicles and laminae [15]

Three processes- two transverse and one spinous- project from the vertebral arch and afford attachments for deep muscles and form levers that help the muscles to move the vertebrae.

The four articular processes project superiorly and inferiorly respectively from the vertebral arch and are in apposition with corresponding vertebrae superior and inferior to them. Their function is to restrict movements in certain directions or at least to decree which movements may be permitted. The articular processes also prevent the vertebrae from slipping anteriorly. When one rises from the flexed position, the articular processes bear weight temporarily. The inferior articular processes of L5 vertebra bear weight even in erect posture. [15]



Normal lumbar vertebra, seen from above
Vue supérieure d'une vertèbre lombaire normale



Normal lumbar vertebra, side view
Vue latérale d'une vertèbre lombaire normale

Figure 2. Structure of a vertebra (superior and lateral view) [5]

4.1.4 Cervical vertebrae

Cervical vertebrae form the bony skeleton of the neck (figure 3). The smallest of the 24 moveable vertebrae, the cervical vertebrae are located between the skull and the thorax. The cervical vertebrae are relatively small bones and bear less weight than do the vertebrae inferior to them. The distinctive feature of each cervical vertebra is the oval foramen of the transverse process. These foramina are smaller in C7 than those in other cervical vertebrae; occasionally these foramina are absent. The vertebral arteries pass through the transverse foramina, except those in C7, which transmit only small accessory vertebral veins. The transverse processes of cervical vertebrae end laterally in two projections – the anterior and posterior tubercles. The large anterior tubercles of

C6 are called carotid tubercles because the common carotid arteries may be compressed against them to control bleeding from these vessels. [15]

C3 through C7 vertebrae (figure 3) are characterized by large vertebral foramina because of the cervical enlargement of the spinal cord that provides the innervation of the upper limbs. The superior borders of the bodies of these vertebrae are raised posteriorly, especially at the sides, but are depressed anteriorly. Their raised margins are uncinate processes. The spinous processes of C3 through C6 vertebrae are short and usually bifid in white persons but usually not in black persons. C7 is a prominent vertebra that is characterized by a long spinous process; because of this prominent process, C7 is called the vertebra prominens. [15]

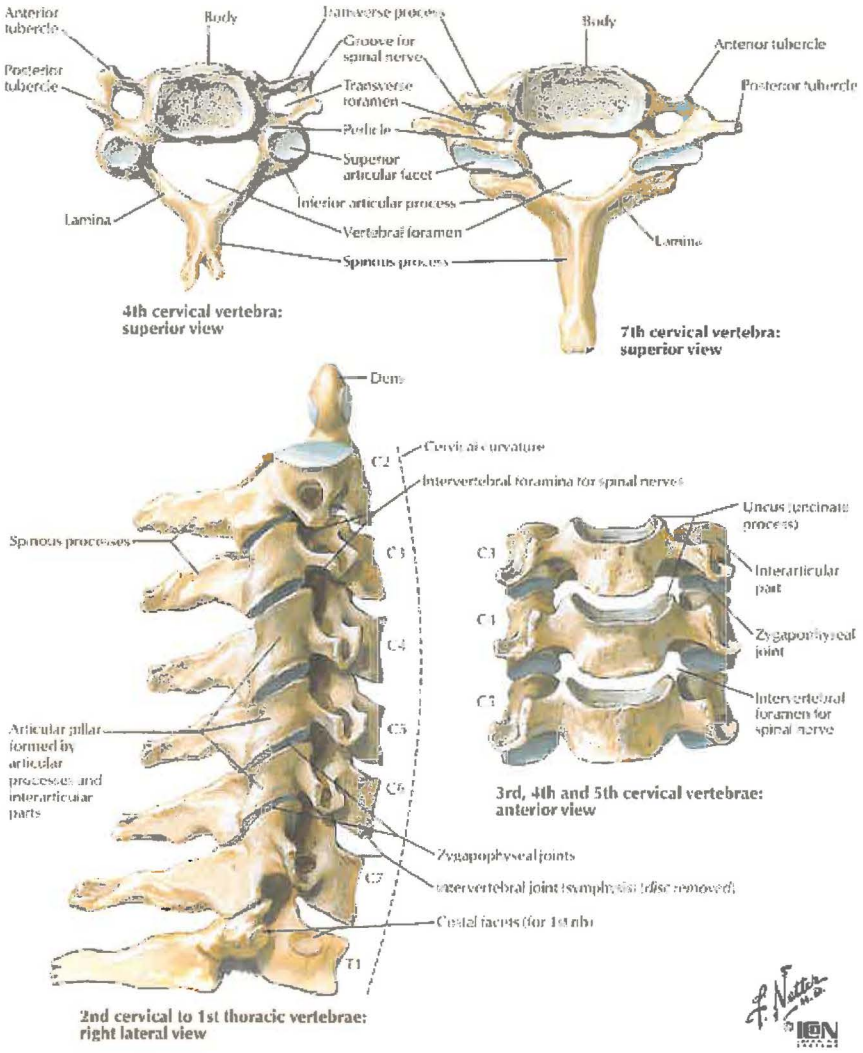


Figure 3. Cervical spine, characteristics of C3-C7 (superior, posterior and lateral view) (5)

C1 and C2 are atypical cervical vertebrae. C1 – the atlas- (figure 4) is a ring shaped bone. The atls is the widest of the cervical vertebrae. Because it supports the skull, it was named after Atlas who, according to Greek mythology, supported the earth on his shoulders. The kidney-shaped, concave superior articular surfaces of C1 receive the two large protuberances at tha 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; it consists of anterior and superior arches, each of which has a tubercle and a lateral mass. The posterior arch, which corresponds to the lamina of a typical vertebra, has a wide groove for the vertebral artery on its superior surface. The 1st cervical nerve occupies this groove. (15)

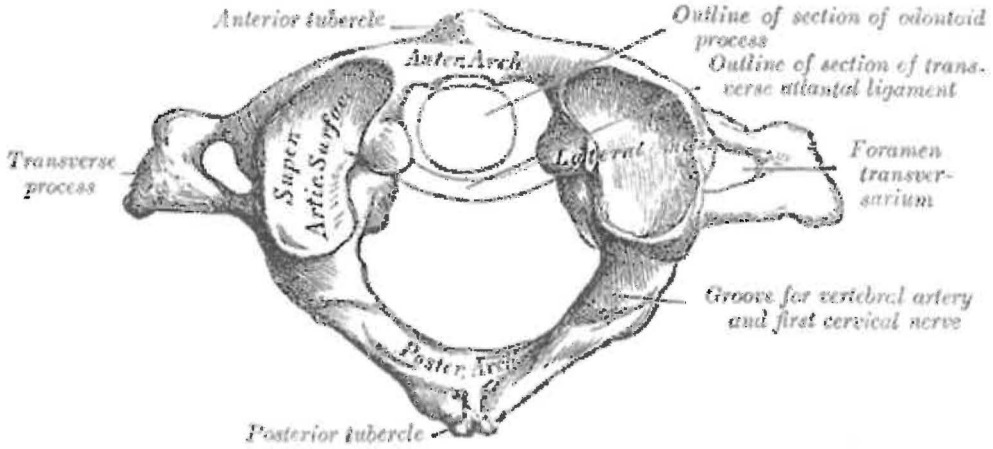


Figure 4. Atlas, first cervical vertebra (superior view) (5)

C2- the axis (figure 5) – is the strongest of the vertebrae because C1, carrying the skull, rotates on it when a person is shaking the head, for example. The axis has two large, flat bearing surfaces, the superior articular facets, on which the atlas rotates. The distinguishing feature of the axis is the blunt toothlike dens (odontoid process), which projects superiorly from its body. The dens is held in position by the transverse ligament of the atlas, which prevents horizontal displacement of the atlas. C2 has a large bifid spinous process that can be felt deep in the nuchal groove- the posterior groove of the neck. (15)

The reason C1 and C2 vertebrae are atypical is because part of the bony of C1 is transferred to the body of C2. The part of the body that remains with C1 is represented by the anterior arch of C1. The part of the body of C1 that was transferred to C2 becomes the dens. It is the pivot around which C1 (carrying the head) rotates. (2)

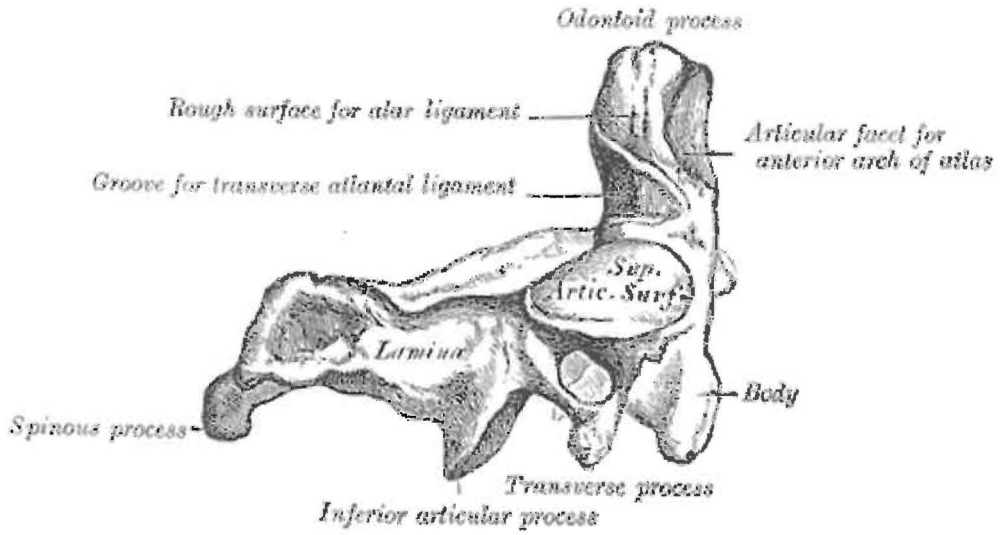


Figure 5. Second cervical vertebra, or axis or epistropheus (lateral view) [5]

4.1.5 Thoracic vertebra

The thoracic vertebrae (figure 6) compose the middle segment of the vertebral column, between the cervical vertebrae and the lumbar vertebrae. They are intermediate in size between those of the cervical and lumbar regions; they increase in size as one proceeds down the spine, the upper vertebrae being much smaller than those in the lower part of the region. They are distinguished by the presence of facets on the sides of the bodies for articulation with the heads of the ribs, and facets on the transverse processes of all, except the eleventh and twelfth, for articulation with the tubercles of the ribs.
These are the general characteristics of the second through eighth thoracic vertebrae.

The first and ninth through twelfth vertebrae contain certain peculiarities, and are detailed below. The bodies in the middle of the thoracic region are heart-shaped, and as broad in the antero-posterior as in the transverse direction.
At the ends of the thoracic region they resemble respectively those of the cervical and lumbar vertebrae. They are slightly thicker behind than in front, flat above and below, convex from side to side in front, deeply concave behind, and slightly constricted laterally and in front. 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. The pedicles are directed backward and slightly upward, and the inferior vertebral notches are of large size, and deeper than in any other region of the vertebral column. The laminae are broad, thick, and imbricated — that is to say, they overlap those of subjacent vertebrae like tiles on a roof. The vertebral foramen is small, and of a circular form. The spinous process is long, triangular on coronal section, directed obliquely downward, and ends in a tuberculated extremity. These processes overlap from the fifth to the eighth, but are less oblique in direction above and below. The superior articular processes are thin plates of bone projecting upward from the junctions of the pedicles and laminae; their articular facets are practically flat, and are directed backward and a little lateralward and upward. The inferior articular processes are fused to a considerable extent with the laminae, and project but slightly beyond their lower borders; their facets are directed forward and a little medialward and downward. The transverse processes arise from the arch behind the superior articular processes and pedicles; they are thick, strong, and of considerable length, directed obliquely backward and lateralward, and each ends in a clubbed extremity, on the front of which is a small, concave surface, for articulation with the tubercle of a rib.

The first thoracic vertebra has, on either side of the body, an entire articular facet for the head of the first rib, and a demi-facet for the upper half of the head of the second rib. The body is like that of a cervical vertebra, being broad transversely; its upper surface is concave, and lipped on either side. The superior articular surfaces are directed upward and backward; the spinous process is thick, long, and almost horizontal. The transverse processes are long, and the upper vertebral notches are deeper than those of the other thoracic vertebrae.

The ninth thoracic vertebra may have no demi-facets below. In some subjects however, it has two demi-facets on either side; when this occurs the tenth has only demi-facets at the upper part.

The tenth thoracic vertebra has (except in the cases just mentioned) an entire articular facet on either side, which is placed partly on the lateral surface of the pedicle.

In the eleventh thoracic vertebra the body approaches in its form and size to that of the lumbar vertebrae. The articular facets for the heads of the ribs are of large size, and placed chiefly on the pedicles, which are thicker and stronger in this and the next vertebra than in any other part of the thoracic region. The spinous process is short, and

nearly horizontal in direction. The transverse processes are very short, tuberculated at their extremities, and have no articular facets.

The twelfth thoracic vertebra has the same general characteristics as the eleventh, but may be distinguished from it by its inferior articular surfaces being convex and directed lateralward, like those of the lumbar vertebrae; by the general form of the body, laminae, and spinous process, in which it resembles the lumbar vertebrae; and by each transverse process being subdivided into three elevations, the superior, inferior, and lateral tubercles: the superior and inferior correspond to the mammillary and accessory processes of the lumbar vertebrae. Traces of similar elevations are found on the transverse processes of the tenth and eleventh thoracic vertebrae. [4]

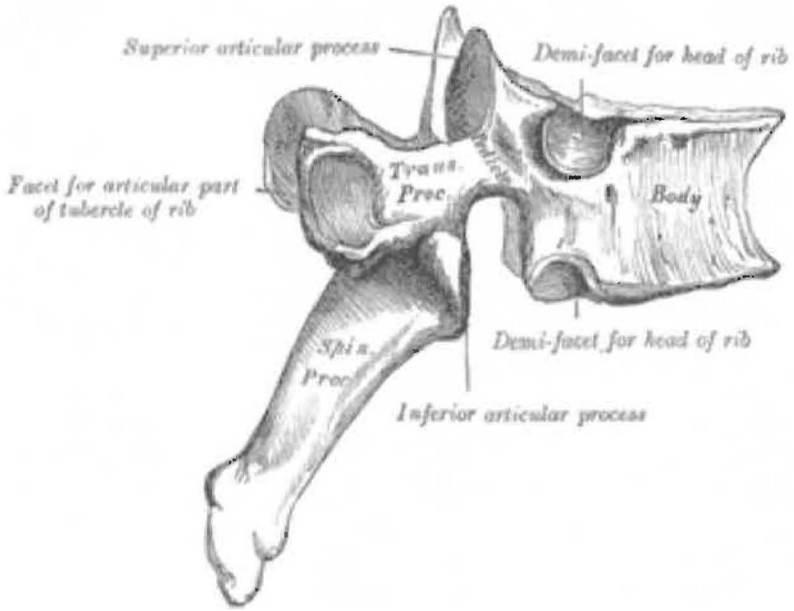


Figure 6. A thoracic vertebra (lateral view) [5]

4.2 Functional Anatomy of Cervical Spine

The cervical spine's range of motion is approximately 45°-60° of flexion, 45° of extension, 45° of lateral flexion, and 60°-75° of rotation to both sides. However, movement in the cervical spine is complex, because pure uniplanar movement does not accurately portray the motion between cervical levels, and movement into any range is not the simple sum of equal motion from one vertebra to the next. [21][8]

4.2.1 Normal Kinematics of the Upper Cervical Spine

The first cervical vertebra, the atlas, has often been labelled the cradle, because its articulation with the occiput of the skull provides a cradle for supporting the head. The atlas articulates with the occipital condyles, and its primary motions are flexion and extension. Normal flexion to hyperextension at the atlanto-occipital joint ranges from approximately 15° to 20°. Rotation and lateral flexion between the occiput and atlas are not possible due to the depth of the atlantal sockets, in which the occipital condyles rest. Rotation to one side causes the contralateral occipital condyle to contact the anterior wall of its atlantal socket and the ipsilateral condyle to contact the posterior wall of its respective atlantal socket. Similarly, lateral flexion requires the contralateral occipital condyle to lift out of its socket, a movement that is restrained by the tight atlanto-occipital joint capsule.

The weight of the head is transferred to the cervical spine through the lateral atlanto-axial articulations of C2

Rotation is possible at C1 through C2 because, unlike the atlanto-occipital joint, 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 and is not visible on a radiograph. 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. 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. This coupling, or reversal of motion, is a unique characteristic of the spine, may be experienced at different levels, and will also be important in understanding mechanisms of injury

Another feature of the atlanto-axial joint also found in other segments in the cervical region is that pure rotation of the atlas on the axis does not occur without a small degree of extension and lateral flexion and sometimes flexion. Again, the line of vertical forces being distributed through the occiput to the atlas as the head moves determines the amount of coupling motion in the atlas as it balances between the head and the axis. [21]

4.2.2 Normal Kinematics of the Cervical Column

At the C2 through C3 junction, the upper cervical spine meets the remaining, more typical cervical column. The body of the axis acts as a "root" within C3, securing the upper cervical spine in the remaining cervical column. The articulating surfaces of the inferior and superior intervertebral joints are similar to a saddle joint, maintaining anterior-posterior and medially and laterally directed concavities. This orientation of the cervical bodies of the mid to lower cervical column allows for rotation and flexion movements but is resistant to lateral flexion. Lateral flexion is possible as a combined movement in the cervical column but only due to coupled rotational movement in each segment to that side.

General flexion and extension motion of the neck does not necessarily reflect the movement among vertebrae in the cervical spine. In fact, a vertebra may experience its greatest range of motion in flexion or extension before the cervical column itself has fully flexed or extended. Furthermore, a vertebra may experience a large range of movement in one direction while the cervical column on the whole exhibits movement in the opposite direction. The order of contribution from cervical segments into flexion and extension varies by level as well. Through high-speed cineradiography, Van Mameren et al 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. [21]

4.3 Muscles anatomy

Table 1 . Important muscles around cervical and thoracic spine that appear lession in UCS[2][7]

Muscle	Origin	Insertion	Function
M.Trapezius Upper fibers	External occipital protruberance, superior nuchal line, spinous processes of seventh cervical vertebrae	Lateral one third of clavicle and acromion process of scapula	With the origin fixed adduction of scapulas mainly performed by middle fibers. Lateral rotation of scapula by the upper and lower fibers with stabalization by the middle. Upper fibers also elevate scapula and lower depress it. With insertion fixed, acting unilaterally the upper fibers extend, laterally flex and rotate the head to the opposite side. Acting bilaterally
Middle fibers	Spinous processes of first through fifth thoracic vertebrae	Medial margin of acromion and superior lip of spine of scapula	
Lower fibers	Spinous processes of sixth through twelfth thoracic verteabra	Tubercle at apex of spine of scapula	

			upper trapezius extends the neck
M.Levator scapulae	Transverse processes of C1 to C6	Medial border of scapula between superior angle and root of spine	Elevates scapula. With the insertion fixed working unilaterally rotates the head to the same side, working bilaterally extends the head.
M.Rhomboid major	Spinous processes of T2 to T5	Medial border of scapula between spine and inferior angle	Adducts and elevates scapula and laterally rotate it
M.Rhomboid minor	Lower portion of ligamentum nuchae, spinous processes of C7 and Th1	Medial border of scapula at the spine of scapula	Adducts and elevates scapula and laterally rotate it.
M.Subscapularis	Subscapular fossa of scapula	Lesser tubercle of humerus	Medially rotates the shoulder
M.Supraspinatus	Medial two thirds of supraspinous fossa of scapula	Superior facet of greater tubercle of humerous	Abducts the shoulder joint
M.infraspinatus	Medial two thirds of infraspinous fossa	Middle facet of greater tubercle of humerous	Laterally rotates the shoulder joint
M.teres minor	Upper two thirds, dorsal surface of lateral border of scapula	Lowest facet of greater tubercle	Laterally rotates the shoulder joint
M.Pectoralis Major	Medial half of	Proximal part of	Adduction, medial

	clavicle and anterior surface of sternum, first seven costal cartilages, aponeurosis of m. external oblique	humerus (lateral lip of intertubecular groove)	rotation of humerous with the origin fixed. With the insertion fixed, assist in elevating thorax as in forced inspiration. The upper part flexes and medially rotates the shoulder joint, and horizontally adduct humerous to the opposite shoulder
M.Pectoralis minor	Anterior surfaces of the third, fourth and fifth ribs, and deep fascia overlying the related intercostals spaces	Coracoid process of scapula	Anteriorly tilts scapula. Assists in forced inspiration
M.Serratus anterior	Lateral surfaces of upper 8-9 ribs and and deep fascia overlying the related intercostals spaces	Costal surface of medial border of scapula	Keeps medial border and inferior angle of scapula apposed to thoracic wall, abducts and laterally rotates scapula when origin is fixed. With the insertion fixed may act in forced inspiration.
M.Sternocleidomastoid	Medial or sternal	Lateral surface of	Acting bilaterally

	head: Cranial part of manubrium sterni Lateral or clavicular head : Median one third of clavicle	mastoid process, lateral one half of superior nuchal line of occipital bone	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	Tubercle on anterior arch of atlas Anterior tubercles of transverse processes of fifth and sixth cervical vertebrae Anterior surface of bodies of second,	Flexes the head, laterally flexes and rotates it to the same side

	thoracic and last three cervical vertebrae	third and cervical vertebrae	
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	Anterior tubercles of transverse processes of third to sixth cervical vertebra	Scalene tubercle and cranial crest of first rib	Acting bilaterally flexes the head. Acting unilaterally laterally flexes and rotates the head to the opposite side
Medius	Posterior tubercles of transverse processes of second through seventh cervical vertebrae	Cranial surface of first rib between tubercle and subclavian groove	Acting unilaterally laterally flexes and rotates the head to the opposite side
Posterior	Posterior tubercles of transverse proceses of last two	Outer surface of second rib	Acting unilaterally laterally flexes and rotates the head to

	or three cervical vertebrae.		the opposite side
M.gluteus maximus	Posterior surface of lower part of sacrum, posterior gluteal line of ilium, side of coccyx, apeneurosis of erector spinae, sacrotuberous ligament, and gluteal aponeurosis	Larger proximal portion and superficial fibers of distal portion of muscle into iliotibial tract of fascia lata. Deep fibers of distal portion into gluteal tuberosity of femur.	Extends, laterally rotates, and lower fibers assist in abduction of the hip joint. The upper fibers assist in abduction.
M.iliopsoas	Transverse processes of all lumbar vertebrae, sides of bodies and intervertebral discs, superior two thirds of iliac fossa, iliac crest, iliolubar and vertral sacroiliac ligaments	Lesser trochanter of femur, lateral side of tendon of Psoas major, and just distal to the lesser trochanter	Flexes the hip joint, may assist in lateral rotation and abduction of the hip joint with the origin fixed. With the insertion fixed will increase the lumbar lordosis.

Table 2. Respiratory muscles with reported lesions in UCS[19][16]

Muscle	Origin	Insertion	Function
Diaphragma	The xiphoid process of sternum, the costal margin of the thoracic wall, the ends of ribs XI and XII, ligament that span across	To a central tendon (thin strong aponeurosis with no bony attachment)	Separates the thoracic and abdorminal cavities. During inspiration contracts and descents. During expiration

	structures of the posterior abdorminal wall, vertebrae of the lumbar region		diaphragma relaxes and ascends decreasing the volume of thoracic cavity
M.External Intercostal	Inferior margin of rib above	Superior surface of rib below	Most active during inspiration; support intercostals space; move ribs superiorly
M.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

4.3 Upper crossed syndrome

4.3.1 History and Definition

Upper crossed syndrome was originated by Vladimir Janda. Dr Janda was known as the "Father of Czech Rehabilitation." He graduated from Charles University in Prague in 1952, specializing in neurology and later in rehabilitation medicine. Janda was very interested in the functional role of muscles, and this led to testing his patients with surface electromyography. This information demonstrated patterns of muscle contraction in relationship to particular limb movements and the timing of recruit patterns of synergists. In nineteen seventy nine, he identified crossed syndromes of muscle imbalance for the upper and lower extremities based on research and clinical observations[18]

The upper crossed syndrome (figure 7) is defined as weak lower and middle trapezius, short upper trapezius and levator scapulae, weak deep neck flexors, and short subboccipital muscles and sterncleidomastoid, weak serratus anterior and short pectoralis major and minor. Janda named this syndrome "Upper Crossed" because

when the weakened and shortened muscles are connected in the upper body, they form a cross. [6] [13]

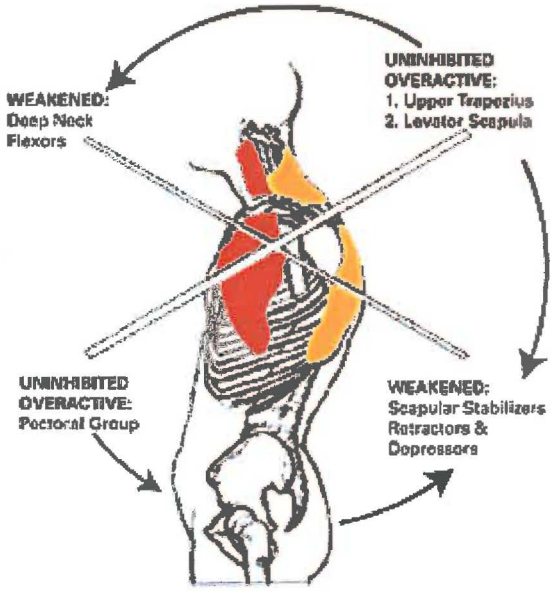


Figure 7. Muscle imbalance according to upper cross syndrome [17]

4.3.2 Frequency

Examinations were being carried out from the first to the fourth months of the year 1997 in a private rehabilitation studio of Helena Horáková in Kopřivnice. 72 men and 48 women in the age from 30 to 40 years were evaluated, the average age of the sample of men was 34.05 years, for the sample of women it was 32.93 years. An overwhelming majority of the evaluated persons worked in the works Tatra a. s. Kopřivnice. The majority of the women worked as administrative workers, within the sample of men, there were both men working manually, and men employed in offices. [20]

The results of the research are shown in the following tables.

TABLE 3[20]

Percentual frequency of the occurrence of shortened muscles in the sample of men, n=72, 1=1.39 %	Percentual frequency of the occurrence of weakened muscles in the sample of men, n=72, 1=1.39 %

n	n
%	%
1).M.trapezius	1).Deep neck flexors
28	52
38.9	72.2
2).M.pectoralis major	2).Lower scapula fixators
16	20
22.2	27.8

TABLE 4[20]

Percentual frequency of the occurrence of shortened muscles in the sample of women, n = 48, 1 = 2.08 %	Percentual frequency of the occurrence of weakened muscles in the sample of women, n = 48, 1 = 2.08 %
n	n
%	%
1).M.trapezius	4.Deep neck flexors
32	36
66.7	75.0
2).M.pectoralis major	5.Lower scapula fixators
0	32
0	66.7

4.3.3 Diagnosis and types

The combined result of this posture is that the cervicocranial, glenohumeral, and tempomandibular joints are all overstressed. Joint dysfunction and trigger points naturally result from these muscle imbalances associated with headache, neck pain, shoulder blade pain, and TMJ and shoulders disorders. Each of the three muscle imbalances that contribute to the upper crossed syndrome are discussed in the context of the key movement pattern that is affected: scapulohumeral rhythm, neck flexion, and trunk lowering from a push up. Respiration, which is also affected, is discussed as well. [13]

A) Altered scapulothoracic and scapulohumeral rhythm

The scapulohumeral rhythm is important for its relationship to prehension, reaching, grasping, and carrying activities

Week agonist: m.lower and m.middle trapezius

Overactive synergist: m.upper trapezius, m.levator scapulae, and m.rhomboids

Symptoms:

- Neck pain
- Headaches
- Rotator cuff syndrome
- Shoulder blade pain

Postural analysis:

- Gothic shoulders
- Upward rotation of scapulas

Gait analysis:

- Altered arm swing
- Shoulder elevation with arm flexion

Muscle length test

- Shortened m.upper trapezius and m.levator scapulae

Evaluation of key movement patterns:

- Altered scapulohumeral rhythm (scapular fixation)
- Upper thoracic breathing

Trigger points

- M.Upper, middle and lower trapezius
- M.Levator scapulae
- M.Subscapularis

Mobility (joint dysfunction)

- Upper cervical spine
- Cervicothoracic junction [13]

B) Altered head, neck flexion

Head/neck flexion is important for its relationship to standing or sitting posture and mastication.

Week agonist: deep neck flexors

Overactive antagonist: suboccipital muscles

Overactive synergist: m. SCM

Symptoms:

- Headache
- Neck and shoulder blade pain
- TMJ

Postural analysis:

- Head-forward posture
- Prominence of m.SCM

Muscle length test

- Shortened m.SCM
- Shortened suboccipitals

Evaluation of key movement patterns

- Altered coordination during neck flexion

Trigger points

- m.SCM
- Suboccipitals
- m.Middle trapezius
- Masticatory muscles
- Mastoid process

Mobility (Joint dysfunctions)

- C0-C1 and C/T junction
- Lower cervical spine
- TMJ [13]

C) Altered scapula fixation during trunk lowering from a push-up

Scapular fixation is important for carrying, pushing and pulling activities

Weak agonist: m.serratus anterior

Overactive antagonist: m.rhomboids

Overactive synergist: m.upper trapezius, m.levator scapulae, and m.pectoralis major, minor

Symptoms:

- Neck and shoulder blade pain

- Round cuff syndromes
- Cervicobrachial syndrome

Postural analysis

- Round shoulders
- Winged scapulae

Gait analysis

- Winged scapulae with arm movement

Muscle length tests

- Shortened m.pectoralis major
- Shortened m.upper trapezius and m.levator scapulae

Evaluation of key movement patterns

- Altered scapula fixation during trunk lowering from a push-up

Trigger points

- M.pectoralis major
- m.upper trapezius
- m.levator scapulae
- m.pectoralis minor

Mobility (joint dysfunction)

- decreased upper thoracic extension [13]

Discussion for respiration (abnormal respiration)

Agonist: Diaphragma

Overactive synergist: m.scalenes, m.ntercostals, m.upper trapezius

Symptoms

- Neck pain and headaches
- Chest wall pain
- Thoracic outlet syndrome

Postural analysis

- Elevated shoulders
- Forward-drawn head
- Thoracic kyphosis

Evaluation of key movement patterns

- Upper thoracic breathing

Trigger point

- Scalenes

Mobility (joint dysfunction)

- Decreased lateral bending and extension of cervical spine
- Decreased lateral excursion of the rib cage [13]

4.3.4 Physical Examination

Observation

- The examination begins with observation of the patient during the history portion of the evaluation. This includes head and neck posture and movement during normal conversation. Typically the patient has the forward- drawn head position, with rounded and elevated shoulders and winging scapulas, and sometimes increase of lumbar lordosis. [8]

- Observation and evaluation of anterior, posterior and side view of the patient in erect standing position is necessary, in order to take information for patient's posture. Posture evaluation will give us information about the positions of the various joints and body segments, muscle balance or imbalance associated with static postural positions. [7])[8]

Palpation

- Palpation examination and barrier phenomenon of skin, connective tissue, muscle fascia, and muscle mass, will give us information for possible presence of hyperalgic skin zones (HAZ), tender points and trigger points, restriction of mobility of fascia, muscle spasm, hypertonicity or hypotonicity on muscles. [8][12]

• On palpation, tenderness of hyperactive muscles (e.g m.SCM, m.Upper trapezius) and several trigger points (e.g TMJ, mastoid process) as referred in the chapter 2.3.6 can be found [13]

Motor examination

• We should examine active mobility, passive mobility and movement against resistance. Active mobility shows both muscular activity and joint mobility uninfluenced by the examiner. Any force applied by the examiner may be less than, equal to or greater than that used by patient; we then have concentric (resisted) movement, isometric resistance, or eccentric movement. Each technique examines muscular function (the strength of the muscle, reaction to pain provoked in the muscles, possible muscle imbalance, even coordination). Passive movement shows the degree of mobility of joints and may at the same time reveal muscular tension or spasm. Examination of a particular joint may disclose normal, increased, or restricted mobility. This may affect functional movement as well as joint play (is a passive movement, which cannot be carried out by the subject and comprises a translatory (sliding) movement of one joint surface against the other, or even rotation and also distraction). [12]

• Examination of the six basic moving patterns (hip extension, hip abduction, trunk curl up, head flexion, shoulder abduction, push up) is necessary in order to evaluate the coordinated activity between different muscle groups and the timing in which muscles are activated. [7] The most important patterns to be observed are the head and neck flexion, shoulder abduction and push up which will show the altered movement patterns to diagnose upper crossed syndrome. [7] Poor movement patterns have an adverse effect on both joint and muscle mechanics and will produce or perpetuate spinal blockage. [12]

• Manual muscle testing is one of the most important aspects for detecting the muscle weaknesses and imbalances referred to the previous chapter 2.3.7 [13][8][7]

• Muscle length tests are done for the purpose of determining whether the range of muscle length is normal, limited, or excessive. Muscles that are excessive in length are

usually weak and allow adaptive shortening of opposing muscles; muscles that are too short are usually strong, and maintain opposing muscles in a lengthened position. Muscle length testing consists of movements that increase the distance between origin and insertion, elongating muscles in directions opposite to that of the muscle actions. [8]

• Mobility of joints (joint play) should also be examined to determine the joint dysfunction or blockages .[13] In the upper crossed syndrome joint dysfunction and blockages of Co-C1, TMJ, upper cervical spine, lower cervical spine, C/T crossing, Upper thoracic spine, ribs can be detected. [13]

• Range of motion (ROM) of joints can also be examined to show the joint dysfunction and restrictions coming from the shortness of the muscles. In upper crossed syndrome shortness of the muscles around neck result in decreased ROM with pain of all the motions of neck and neck. [13] [11]

Neurological examination

• On sensation examination, the sensation is usually normal with no changes. Deep tendon reflexes examination is also negative. The cervicogenic headache coming from the spinal stenosis of the upper cervical stenosis is the most usual neurologic sign. [11][2]

4.3.5 Imaging Studies

Plain radiographs

Radiographs of the cervical spine usually are the first diagnostic tests ordered in patients presenting with neck and limb symptoms. Radiographs are very helpful to detect degenerative changes of the of cervical spine and possible spondylolisthesis. [11]
Disabilities of the articulations of the head and cervical spine can often be detected only by exact measurement of functional radiographs. From two radiographs, one in flexion and one in extension, not only can the total mobility of the head be measured, but also the mobility of the individual articulations can be evaluated by taking exact measurements of the position of each vertebra. A method for semi-automatic measuring of such pairs of radiographs is presented. Edges and structures of the bones

that are clearly visible in both radiographs are digitized on a graphics tablet. Then, by computer program, each vertebra of the first radiograph is shifted and rotated until it fits best to the respective vertebra of the second radiograph. Thus, for each articulation, the mobility angle and the location of the mobility axis relative to the adjacent vertebra, can be computed. First experiences with this method are presented. (14)

4.3.6 Treatment

Aim of the treatment according to different types of upper crossed syndrome:

A) Treatment approach for altered scapulohumeral rhythm:
- Facilitate/strengthen m.lower and m.middle trapezius
- Relax/stretch m.upper trapezius
- Relax/stretch m.subscapularis
- Adjust/mobilize cervicothoraric junction and sternoclavicular joint
- Breathing correction and ergonomic advice (13)

B) Treatment approach for altered neck flexion
- Relax/stretch m.SCM
- Relax/stretch suboccipital muscles
- Adjust/mobilize C0-C1 and cervicothoracic junction
- Facilitate/strengthen deep neck flexors
- Correct poor sitting posture
- Lumbopelvic stabilization exercices(13)

C) Treatment approach for altered trunk lowering from a push-up
- Facilitate/strengthen m.serratus anterior
- Relax/stretch m.pectoralis major and minor
- Relax/stertch m.upper trapezius
- Adjust/mobilize upper thoracic spine
- Postural re-education (13)

D) Treatment approach for altered respiration
- Relax/stretch m.scalenes

- Relax/stretch m.upper trapezius
- Facilitate/train diaphragmatic breathing
- Adjust/mobilize cervical and thoracic spine
- Postural re-education[13]

Specific postural exercises can be included:
Brugger's position of external arm rotation, shoulder abduction and retraction of the scapulae .This position with simultaneous head and neck elongation is a strengthening exercise for deep neck flexors and lower scapular stabilizers. [2]

Most patients will be asymptomatic by the sixth visit and will demonstrate significant improvement in functional performance. The length of time it took to develop the problem is an indicator of how long you will need to work on correcting the faults before results will be felt. Don't forget that pain is often only the tip of the iceberg, directing you to the real underlying problem: upper crossed syndrome. [17]

It also is important when dealing with the upper crossed syndrome not to ignore the lumbopelvic 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 lumbopelvic region is between weak gluteal muscles with hyperactive hip flexors, and hyperactive lumbar erector spinal with weak abdominal muscles. The patient must be taught pelvic tilt and pelvic bridge exercises to strengthen her abdominal and gluteal muscles which were found to be weak. [16]

5. Special part

5.1 Anamnesis- History

Patient K.V, female, 24 years old

Present medical diagnosis:

Upper crossed syndrome

Family anamnesis:

Mother had postural problem, pain of the low back. Father was healthy.

Personal anamnesis:

- Childhood diseases: The typical childhood diseases
- Operations: Operation of tonsils at 16 years old
- Allergy anamnesis: Not specified
- Abuses: Smoker, alcohol consumption is irregular doses 3-4 times a week.
- Gynecological anamnesis: The patient never had gynaecological problems. Takes birth control pills
- Pharmacological anamnesis: Except from the birth control peals takes analgetic pills for the headaches.
- Previous injuries/other diseases:

Working anamnesis:

She is student and secretary in company. When she is working, she is sitting and working with computer many hours. As a student she is also sitting and writing some hours. Her dominant hand is right. Her posture during sitting at work is faulty as the one leg is over the other and she bents the trunk a lot with hyper extending the cervical spine.

Social anamnesis:

She is single and lives alone. She sports only ones a month, usually swims.

Current disorder

- The patient started to feel neck pain since 15 years old.

- Last two years she has headaches and migraines but she does not feel any vertigo.
- These headaches happen once a month and they normally disappear with painkillers.
- Last two months headaches did not disappear after taking the pills and they happen every week.
- After working for hours she feels also stiffness of the neck and upper back.
- She does not have any pain relief position for the neck pain.
- She uses orthopedic pillow but turning during the sleep.

Previous physiotherapy:

No, this is the first time that the patient attends physiotherapeutic treatment.

Status present:

The patient feels stiff her neck and the upper back, but she had no headaches this time. She looks stressed for her job and studies because her program is full.

5.2 Initial kinesiologic examination

5.2.1 Postural evaluation in standing

Table 5. Anterior view

Sole weight baring	Symmetrical
Transversal sole Arch	Normal
Longitudinal sole Arch	Flat left and right
Calf side	Symmetrical
Patella	Normal position External rotation: negative Internal rotation: negative
Thigh contour	symmetrical in both sides(medial-lateral)
Anterior superior iliac spine	Symmetrical
Umbilicus	No deviations
Sternum	Middle line

Nipples	Symmetrical
Clavicles	Symmetrical
Shoulder position	Both are a bit elevated, the left more dominant hand : right
Trophy of SCM	Prominence and hypertrophy of both sides
Head position	Slight Lateral flexion to the right, rotation to the left

Table 6. Posterior view

Heel form and position	Symmetrical
Achille's tendon contour	Symmetrical
Achille's tendon thickness	Symmetrical
Calf	Symmetrical
Popliteal lines	Symmetrical
Thigh contour	Symmetrical in both sides(medial-lateral)
Subgluteal lines	Symmetrical
Posterior superior illiac spine	Symmetrical
Ilium crests	Symmetrical
Trunk outlines	Right slight concave
Spinous processes	Symmetrical
Inferior scapula angles	Symmetrical
Scapulas medial margin	abducted bilateral
Scapula alata	positive, bilateral
Shoulder position	More elevation of left
Auricles	Symmetrical

Table 7. Side view

Knee joint position	Straight line
Position of pelvis	Slight anterversion
Lumbar part of spine	Slight hyperlordosis
Thoracic part of spine	Slight hyperkyphosis on the upper part
Shoulder position	Slight protraction, bilateral
Cervical part of spine	Slight straightening
Head position	protrusion, forward-drawn position

Conclusion of postural evaluation

According to anterior view (Table 5) the head lateral flexion to one side and rotation to the other and the higher position of shoulders lead me to test the shortness of upper trapezius, levator scapulae and palpate them for possible trigger points and higher tension. Also the prominence of m.SCM leads me to test the length of this muscle and palpate it for possible trigger points or higher tension. According the posterior view (Table 6) sinistro-convex scoliosis on lumbar spine is presented. 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 because of their weakness. According the side view (Table 7). The presence of lumbar hyperlordosis leads me to test the muscle strength of m.rectus abdominis, m.gluteus maximus and also to test if m.iliopsoas and m.erector spinae are short. Important Presence of hyperkyphosis in thoracic part of spine maybe is compensation mechanism due to lumbar hyperlordosis or head forward-drawn position or the opposite. Further examinations are necessary in order to find the primary cause. Shoulder protraction lead me in muscle shortening test of m. pectoralis minor in both sides and palpate it to test the tension and the possible trigger points. Head protrusion lead me to test the muscle strength of m.sternocleidomastoideus, m.scalenii and the deep neck flexors and to test if suboccipitals muscles, m.trapezius upper part and m.levator scapulae are short and palpate them for testing their tension . All of these classical postural signs of upper crossed syndrome must be evaluated with mobility of joints, length and strength of muscles and the dynamic tests to decide the main cause of their appearance.

5.2.2 Anthropometrical measurements

Height: 179 cm

Weight: 59 kg

BMI: 18,4

Trendelenburg test : negative

Distances of spine: table 8

Table 8. Distances of spine

Stibor's distance	10 cm
Forestier's distance	Normal
Cepoje's distance	2 cm
Otto's inclination dist.	3,5 cm
Thomayer's distance	-3 cm

Conclusion of anthrometical measurements

Both measurements of cervical spine were positive which show problem in the mobility of cervical spine. According to Stibor's test the motility of thoracic are more than normal but from the visual examination of the movement during the test shows that the movement comes from the lumbar spine. This ensures Otto's test which show some restriction in the motility of thoracic spine. Finally, Thomayer's test was negative but most of the movement occurred in the lumbar spine and hips, less from thoracic and even less from cervical spine. The less motility of the cervical spine led me to test the extensors of the cervical spine and the joint play of the cervical spine and of the cevicothoracic junction.

5.2.3 Gait evaluation

Step phase: normal
Stance phase: normal
Pelvis rotation: yes
Pelvis shift: yes
Trunk movement: yes
Arm synkinesis: less than normal in both sides but with good rhythm, with some shoulder elevation and more winging of scapula.

Conclusion of gait evaluation

Patient walking: normal, normal and steady rhythm. The step and stance phase were normal. The arm synkinesis shows more winging of scapula probably because of the

weakness of serratus anterior and elevation of shoulders because of the shortening or hypertension of upper trapezius.

5.2.4 Examination of basic moving patterns

The examination of basic moving patterns were provided according to *Vladimir Janda* (13)

Trunk curl up: positive

Pathological sign: Curling movement of the trunk is less in the cervical spine and the upper thoracic and the movement performed anterior tilting of the pelvis and hip flexion.

Head flexion: positive

Pathological sign: The jaw of the patient juts forward at the beginning of the movement with hyperextension in the cervicocranial junction. This shows the weakness of the deep neck flexors and strong m.SCM and the shortening of the suboccipital muscles. The patient had big difficulties to keep the jaw near the chest, and tremor appeared during the test which shows the marked weakness of the deep neck flexors.

Shoulder abduction: positive in both sides

Pathological sign: The movement starts with m.supraspinatous but elevation of shoulders begins at 20 degrees. This early elevation shows the overload of m.upper trapezius.

Push up: positive

Pathological sign: During this test winging and rotating of the scapula occurs. (scapula alata)

Extension in hip joint: positive

Pathological sign: The motion starts with the activation of hamstring muscles instead of gluteus maximus muscle and then continues to back muscles of the patient.

Conclusion of examination of basic moving patterns

Shortening of the neck extensors during neck flexion and trunk curl up. Shortening also of the hip flexors with possibility of weakness of abdominal muscles during trunk curl

up. Marked weakness of deep neck flexors obtained by head flexion. Altered scapulohumeral rhythm during shoulder abduction and coming back from push up. Inhibition of m.rhomboidei, m.serratus anterior, m.trapezius middle and lower part according to push up.

5.2.5 Palpation examination

Skin drag examination [13]: During the examination of skin drug in cervical area, there were hyperalgic zones in the area of suboccipital muscles and the SCM muscle and between scapulas and spine.

Connective tissue [13]: The examination and release was not performed because of the TrP of several muscles around neck

Examination of fascia [13]: During the examination of the dorsal fascia there is restriction in caudocranial direction around the shoulder blade and restriction in cervical fascia which needs stretching.

Palpation examination of muscles: Most of the palpation of posterior muscles performed in prone position which is relaxing one for these muscles. Only m.pectoralis minor, major, abdominal muscles, m.scalenes, m.SCM, m.iliopsoas and subboccipital muscles were examined in supine.

Table 9. Palpation of muscles

Right		**Left**
Hypertonus,TrP Normal tonus with local spasm Hypotonus,TrP	m.trapezius upper part Middle Lower	Hypertonus, TrP Normal tonus with local spasm hypotonus, TrP
hypertonus, TrP	m.levator scapulae	Hypertonus, TrP
hypertonus, tender point	m.Rhomboidei	Hypertonus, tender point
Normal tonus	m.subscapularis	Hypertonus
Normal tonus	m.supraspinatus	Hypertonus

Normal tonus	m.teres minor	Normal tonus
Normal tonus	m.infraspinatus	Normal tonus
Hypertonus, TrP	m.scalenes	Hypertonus, TrP
Spasm	m.SCM	Spasm
Normal tonus	m.pectoralis minor	Normal tonus
Hypertonus	m.pectoralis major	Hypertonus
Hypotonus	m.gluteus maximus	Hypotonus
Normal tonus	m.iliopsoas	Slight local spasm
Normal tonus	m.external oblique	Normal tonus
Normal tonus	m.internal oblique	Normal tonus
Spasm, painful with TrP	m.suboccipitals	Spasm, painful with TrP
Hypertonus	m.rectus abdominis	Hypertonus
Hypotonus	m.transverse abdominis	Hypotonus

Conclusion of palpation examination

According to the skin drag the hyperalgic zones were found in the area of suboccipital muscles and m.SCM and between scapulas and spine. The Fascia also in these areas had restriction. The deeper palpation in these hyperalgic zones shows the big spasm of suboccipital muscles and the m.SCM with associated TrP. After the examination of the tone of the rest back muscles hypertonus was found in m.upper Trapezius, m.levator scapula, m.Rhomboidei with associated TrP and tender points. M.pectoralis major and m.supraspinatus left side was also hypertonus, m.subscapularis left side, m.rectus abdominis, scalene muscles were hypertonus and some of them had associated TrP. All of these hypertonic muscles with the TrP will need to be relaxed during the treatment. Finally m.gluteus maximus and m.transverse abominis were hypotonus and will need facilitation.

5.2.6 R.O.M examination

Goniometry of active movement

Table 10. Head ROM

Right	Head	**Left**
45 °	Lateroflexion	40 °
70 °	Rotation	80⁰

Head flexion	30 °
Head extension	---

Table 11. Shoulder ROM

Right	Shoulder joint	**Left**
175 °	Flexion	170
45 °	Extension	40 °
175 °	Abduction	170
70 °	Internal rotat.	70 °
90 °	External rotat.	80 °

Conclusion of goniometry

The ROM of Head flexion is restricted as well as lateral flexion to left and rotation to right but only some degrees (table 9). The ROM of left shoulder is restricted in most directions but the right one has normal degrees because of dominance of right arm. The extension of head was not measured because it was painful. The muscle length test (passive ROM) will be needed to specify shortening of specific muscles.

5.2.7 Neurological examination

Upper extremities

Table 12. Superficial sensation better physiological or normal

Touch	Normal, same sensation in both sides
Tactile	Normal, same sensation in both sides
Dermatography	Normal, same sensation in both sides

Table 13. Deep sensation

Vibration	Normal, bilaterally same sensation
Sensation of position	Normal
Sensation of movement	Normal

Table 14. Tendon reflexes

Biceps brachii reflex	Normal
Triceps brachii reflex	Normal
Flexion of fingers reflex	Normal

Conclusion of neurological examination

All the neurological examination was negative which shows that there is no radiculation from the cervical spine to the extremities.

5.2.8 Muscle strength tests (according to KENDAL)

Table 15. Muscle strength tests

Right		**Left**
	m.trapezius	
10	upper fibers	9
9	middle fibers	8
7	lower fibers	6
8	m. rhomboideus	8
7	m. serratus anterior	6
8	m. external obliques	9
9	m.internal obliques	8
10	m SCM	10
8	m.rectus abdominis	8
8	m.gluteus maximus	8

Conclusion of muscle strength test

Weakness of muscle serratus anterior both sides, m Rhomboids both sides, lower and middle trapezius both sides detected by the muscle strength test. Right side is a bit better probably because of right hand dominance. Power of abdorminal muscles was less than normal but SCM power was normal.

5.2.9 Muscle length tests

The muscle length tests were provided according to *Vladimir Janda*[8])

Table 16. Muscle length tests

(a)

Right		**Left**
1	m. trapezius upper part	1
1	m. levator scapulae	1
0	m. pectoralis minor	0
1	m/ pectoralis major	1
1	m. iliopsoas	1
1	m. SCM	1

(b)

m. suboccipitals	2
m. erector spinae	1
m. scalenii	0

Conclusion of muscle length test

According to these tests shortening exists in m. trapezius upper part in both sides, m. levator scapulae in both sides, m pectoralis major in both sides, illiopsoas both sides, and SCM both sides. The greater shortening appeared at he suboccipitals muscles, and some shortening also to erector spina. Pectoralis minor and m.scaleni had normal length.

5.2.10 Breathing examination [8]

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 and diaphragm does not descent enough. From the sequence of the inspiration it is detected that the chest breathing predominates the abdominal breathing and the lateral expansion of ribs is impaired

Expiration: The controlled, forced and prolonged expiration were examined. The examination shows the overload of rectus abdominis and the decreased use of the transversal muscles.

Conclusion of breathing examination

The breathing examination shows a paradoxical breathing with the predomination of the chest breathing over the abdominal breathing. The lateral expansion of ribs is less during inspiration and the transverse abdominis is inhibited during expiration.

5.2.11 Joint play examination

The joint play examination performed according to *Karel Lewit* [10]

Table 17. Joint play examination

Co-C1 joint	Restriction of joint play in dorsal direction and lateral flexion
C-Th crossing	Restriction of joint play in lateral direction which segment
Acromio-clavicular joint	No restriction bilaterally
Sterno-clavicular joint	No restriction bilaterally
Shoulder joint	No restriction bilaterally
Scapulo-thoracic joint	No restriction bilaterally
Ribs	No restriction bilaterally
Thoracic part of spine	No restriction bilaterally

Conclusion of joint play examination

There were blockages in Co-C1 and C-Th crossing which will need to be released by mobilization or manipulation techniques.

5.2.12 Conclusion and discussion of initial kinesiologic examination

- Obtaining the history is important for the proper diagnosis. The therapist should first determine the main complaint. [9] In this case the main complaint is the stiffness, pain of the neck and the headaches.
- Activities and head positions that increase or decrease symptoms are also helpful in making the diagnosis, as well as in guiding treatment. When did the pain occur for the first time, how was the pain, and what was done are all important inquiries for the patient. Prior episodes of similar symptoms or localized neck pain are important for diagnosis and ultimate treatment. [9] Here the patient declared that after a long day in work feels worse in her neck. Her neck pain started around the age of 15 but last two years has also headaches every month and after taking some painkillers the pain was reduced. Now the headaches happen every week and are not diminished after taking painkillers.
- Assessment of family anamnesis with similar or other postural problems should also be obtained. [9] The patient's mother had only pain on her low back
- The therapist should ask what previous treatments have been tried including use of ice and/or heat and medications (eg, acetaminophen, aspirin, nonsteroidal anti-inflammatory drugs) [9] She used only painkillers for headaches and birth control pills.
- Questions on previous medical treatment should include physical therapy, traction, manipulation, previous injections, or surgical treatments. A social history should include sport and position, occupation, and the use of nicotine and/or alcohol. [9] She did not have any previous rehabilitation, and only one tonsil operation. Her job is secretary sitting a lot of time in front of the computer with a false pattern. She also smokes and drinks alcohol.
- Janda identified an upper crossed syndrome with typical pairs of weak and tight muscles: The imbalance in the following pairs of muscles:
  - weak m.lower and middle trapezius, m.rhomboids and short m.upper trapezius and m.levator scapulae,
  - weak deep neck flexors and short suboccipitals and m.SCM
  - weak m.serratus anterior and short m.pectoral major [13]

- Table 18 provides the signs related to varius dysfunctions associated with upper crossed syndrome [13]

Table 18. Postural signs of upper crossed syndrome [13]

Postural findings	Dysfunctions
Round shoulders	Shortened m.pectoralis
Forward-drawn head	Kyphotic upper thoracic spine
C0-C1 hyperextension	Shortened suboccipitals
Elevation of shoulders	Shortened m.upper trapezius and m.levator scapulae and weak lower and m.middle trapezius
Winging of scapulae	Weak m.serratus anterior

- The patient's postural and dynamic examination has typical signs of upper crossed syndrome with most important this of the weakness of deep neck flexors and shortness of suboccipital muscles (type 2) and weakness of m.serratus anterior with shortness of m.upper trapezius, m.levator scapulae, and m.pectoralis major (type 3). Type 1 and the thoracic respiration exist as well in some degree.
- Knowledge of this pattern is important for neck, shoulder, or upper back conditions related to abnormal sitting, respiration, mastication, and grasping activities[13]
- Symptoms, such as changes in gait, postural abnormalities of the upper trunk should be obtained. [9] After the examination associated postural abnormalities (e.g forward head position, slight kyphosis of upper thoracic spine) were found. During gait examination changes the winging of scapula was the most obvious change.

- Kim Christiansen, concurred with Janda regarding the idea that different muscles tend to tighten or weaken consistently. These muscles were the same as those described by Janda in his upper crossed syndrome. [1]

- Christiansen states,"Postural patterns are maintained by a complex arrangement of proprioceptive input modified by habits, somatotype, and even psychogenic factors such as self-esteem. Deviations from ideal, efficient alignment eventually result in production of chronic pain symptoms, which have been shown to be predictable. He proposes that muscle testing is an excellent methodology to determine which muscles are weak and strong and can help to identify which specific muscle groups are weaker and which have become shortened. He suggests that a successful treatment program should include individually determined exercises based on the findings of manual muscle testing to regain postural muscle balance. [1]

- A patient with this altered posture, which could be a major contributor to his cervicogenic headache. The pathophysiology of the cervicogenic headache has also been associated with degenerative changes in the upper cervical spine The most common origin of pain is typically in the upper cervical joints, namely the occiput through C1 and the C1 and C2 segments. Degenerative processes cause lack of movement and dysfunction, which cause irritation to the pain-sensitive structures. [19] After the examination of the joint play, blockage in Co-C1 was found which can be connected with the headaches that the patient is complaining

- Headache syndromes are likely to correlate with pathokinesiology involving altered neck flexion and scapulohumeral rhythm. Predictable fuctional pathologies affect the m.SCM, suboccipital muscles, m.upper trapezius, m.levator scapulae, and pectorals (tightness), deep neck flexors, lower and middle trapezius, and serratus anterior (weakness), cervicothoracic junction (hypomobile). Pain provocation of the trigger points (in both tight and week muscles) is present. Typical findings include a slumped, head-forward posture (weak lower fixators of the scapula and tight pectorals) and increased cervicocranial hyperextension (tight suboccipitals and m.SCM with weak deep neck flexors). [13] In this case the patient that complains for the headaches has all the above typical postural signs, tightnesses and weaknesses of muscles and joint dysfunctions which can provoke these headaches.

The comparison of all the separate conclusions associated with above discussion leads me in these results:

1. Most of the symptoms, postural signs, muscle weaknesses and tightnesses, joint dysfunctions, changes in gait and trigger points of certain muscles of the above defined UCS are detected after the initial kinesiologic examination of the patient. The main cause is the bad posture during the job and sitting during classes in university. This false posture leads to overuse of certain muscles, weaknesses of others during the basic movement patterns, paradoxical breathing which also contributes to the falsie use during the every day activities.
2. The type 2 of UCS with weakness of deep neck flexors and tighness of suboccipital muscles is the main problem. Signs of the type 1, type 3, and paradoxical breathing of the UCS are also detected.
3. Headaches which one of the most important subjective signs are provoked by the UCS signs and imbalances. It is a cervicogenic headache caused either by certain TrP of muscles (as defined above) around the cervical spine or by blockages of cervical joints.
4. Therapy must be planned according to all these imbalances and postural faults to reduce the pain and stiffness of neck and the headache firstly, to diminish the imbalances later.

5.3 Short-term and long-term rehabilitation plan

Short-term:

- Decrease of pain and stiffness around neck
- Decrease the frequency and intense of headaches
- Relaxation of hypertonic muscles and TrP.
- Stretch the shortened muscles.
- Mobilize joint blockages from atlantoccipital joint and cervicothoracic junction
- Increase of muscle power of weak muscles
- Increase the restricted range of motion
- Correct sitting and sleeping posture

- Breathing education, facilitate the diaphragmatic breathing
- Instruction of patient how to provide correct the auto-therapy exercises

Long-term:

- Maintain the muscle power
- Maintain the range of motion
- Improve the coordination of muscles
- Correct and maintain breathing pattern
- Maintain good posture during sleeping and sitting in work
- Improving the activities of daily living

5.4 Rehabilitation

First session (22/01/07)

- Full kinesiological evaluation
- Posture correction in sitting position according to Brugger
- Soft tissue techniques for release of dorsal and cervical fascia and the underlying structures
- PIR on m.trapezius upper part, m.levator scapulae, suboccipital muscles , m. erector spinae, m. subscapularis right side, m.SCM, m.scalenes
- PFS for m.pectoralis major, hip flexors and stretching of suboccipital muscles.
- Breathing exercises in supine for activation of m.transverse abdominis and facilitation of diaphragmatic breathing
- Instruction of patient the optimal posture during some activities of daily living (Figure 8, 9, 10)
- Instruction of patient the auto-therapy program:

- Posture correction in sitting position according to Brugger

- Self PIR of m. trapezius upper part, levator scapulae, m. suboccipitals, and m.subscapularis,

- Self-Stretching of m.pectoralis major and hip flexors and suboccipital muscles

- Breathing exercises for the diaphragmatic training, activation of m.transverse abdominis

Second session (24/01/07)

- Control autotherapy program
- Posture correction in sitting position according to Brugger
- Soft tissue techniques for release of dorsal and cervical fascia and the underlying structures
- PIR on m.trapezius upper part, m.levator scapulae, suboccipital muscles, m.erector spinae, m.Subscapularis right side, m.SCM, m.scalenes
- PFS for m.pectoralis major, hip flexors and stretching of suboccipital muscles
- Breathing exercises in supine for activation of m.transverse abdominis and facilitation of diaphragmatic breathing
- Mobilization on Co-C1 level in dorsal direction and in lateral flexion, on C-Th crossing in lateral direction
- Manual traction of cervical spine (isometric traction in supine, rolling with kneeding in supine)
- Klapp exercises for the better stabilization of the scapula (facilitation of m.serratus anterior)
- Active exercises of head in all directions (attention to performance of head flexion using the deep neck flexors and not m.SCM) on a fit ball with correction of sitting
- Instruction of patient to provide correctly the auto-therapy program: all the exercises taught in the first session + clapp exercises, active exercises of head

Third session (26/01/05)

- Control autotherapy program
- Posture correction in sitting position according to Brugger
- Soft tissue techniques for release of dorsal and cervical fascia and the underlying structures

- PIR on m.trapezius upper part, m.levator scapulae, suboccipital muscles, m.erector spinae, m.Subscapularis right side, m.SCM, m.scalenes
- PFS for m.pectoralis major, hip flexors an stretching of suboccipital muscles.
- Breathing exercises in supine for activation of m.transverse abdominis and facilitation of diaphragmatic breathing, breathing exercises on fit ball
- Manual traction of cervical spine (isometric traction, and rolling with kneeding both in supine)
- Clapp exercises for the better stabilization of the scapula (facilitation of m.serratus anterior)
- Active exercises of head in all directions (attention to performance of head flexion using the deep neck flexors and not m.SCM) on a fit ball with correction of sitting
- Exercise with thera-band for strengthening of m.rhomboidei, m.trapezius middle and lower part, m.serratus anterior, m.gluteus maximus

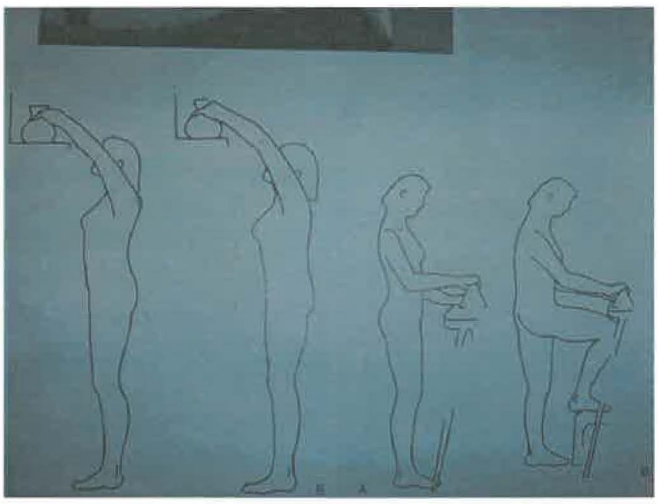
Fourth session (29/01/07)

- Control autotherapy program
- Posture correction in sitting position according to Brugger
- Soft tissue techniques for release of dorsal and cervical fascia and the underlying structures
- PIR on m.trapezius upper part, m.levator scapulae, suboccipital muscles, m.erector spinae, m.Subscapularis right side, m.SCM, m.scalenes
- PFS for m.pectoralis major, hip flexors an stretching of suboccipitals
- Breathing exercises in supine for activation of m.transverse abdominis and facilitation of diaphragmatic breathing, breathing exercises on fitball
- Manual traction of cervical spine (isometric traction, and rolling with kneeding both in supine)
- Clapp exercises for the better stabilization of the scapula (facilitation of m.serratus anterior)
- Active exercises of head in all directions (attention to performance of head flexion using the deep neck flexors and not m.SCM) on a fit ball with correction of sitting

- Exercise with thera-band for strengthening of m.rhomboidei, m.trapezius middle and lower part, m.serratus anterior, m.gluteus maximus

Fifth session (31/01/07))

- Full evaluation of the treatment
- Posture correction in sitting position according to Brugger
- Soft tissue techniques for release of dorsal and cervical fascia and the underlying structures
- PIR on m. trapezius upper part, m. levator scapulae, m. suboccipitals, m.m. , m. erector spinae, m. Subscapularis right side, m SCM, m.scalenes
- PFS for pectoralis major, hip flexors an stretching of suboccipitals
- Breathing exercises in supine for activation of transverse abdominis and facilitation of diaphragmatic breathing, breathing exercises on fitball
- Manual traction of cervical spine (isometric traction, and rolling with kneeding both in supine)
- Clapp exercises for the better stabilization of the scapula (facilitation of serratus anterior)
- Active exercises of head in all directions (attention to performance of head flexion using the deep neck flexors and not m.SCM) on a fit ball with correction of sitting
- Exercise with thera-band for strengthening of m. rhomboidei, m. trapezius middle and lower part, m. serratus anterior, m.gluteus maximus
- Instructions for the autotherapy, show ways to increase loading of exercises



A B A B

Figure 8. Incorrect (A) and correct (B) posture during activities of daily Living. [13]

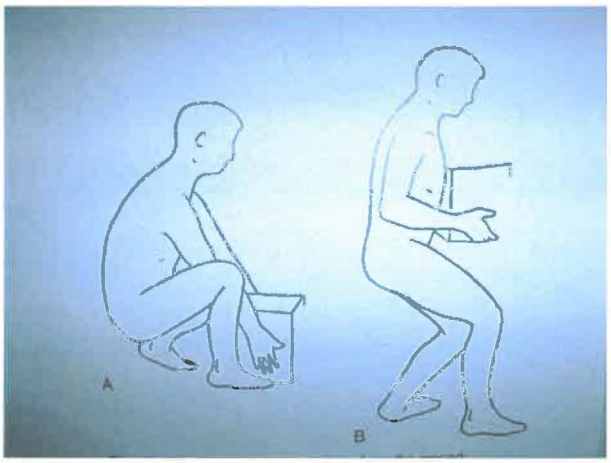


Figure 11. Proper lifting technique from the ground. [13]

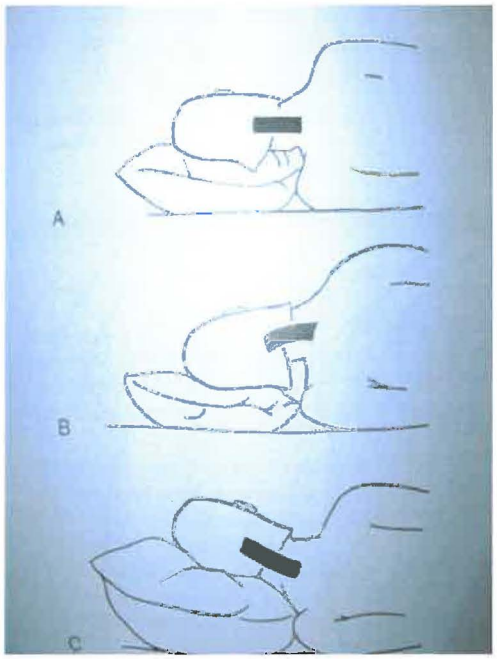


Figure 12 . A, healthy neck/pillow relationship; **B**, too small pillow; **C**, too large pillow [13]

5.5 Final kinesiologic examination

5.5.1 Postural evaluation in standing

Table 19 . Anterior view

Sole weight baring	Symmetrical
Transversal sole Arch	Normal
Longitudinal sole Arch	positive both right and left
Calf side	Symmetrical
Patella	Normal position External rotation: negative Internal rotation: negative
Thigh contour	symmetrical in both sides(medial-lateral)
Anterior superior iliac spine	Symmetrical
Umbilicus	No deviations
Sternum	Middle line
Nipples	Symmetrical
Clavicles	Symmetrical
Shoulder position	**Still elevated but less than before**

	dominant hand : right
Trophy of SCM	**Almost no prominence**
Head position	**Middle line**

Table 20. Posterior view

Heel form and position	Symmetrical
Achille's tendon contour	Symmetrical
Achille's tendon thickness	Symmetrical
Calf	Symmetrical
Popliteal lines	Symmetrical
Thigh contour	Symmetrical in both sides(medial-lateral)
Subgluteal lines	Symmetrical
Posterior superior illiac spine	Symmetrical
Ilium crests	Symmetrical
Trunk outlines	Right slight concave
Spinous processes	Symmetrical
Inferior scapula angles	Symmetrical
Scapulas medial margin	**Symmetrical**
Scapula alata	**Positive but less than before therapy**
Shoulder position	More elevation of left
Auricles	Symmetrical

Table 21. Side view

Knee joint position	Symmetrical
Position of pelvis	**Slight anterversion, a bit improved**
Lumbar part of spine	**Slight hyperlordosis, a bit improved**
Thoracic part of spine	**Slight hyperkyphosis on the upper part but better**
Shoulder position	**Normal**
Cervical part of spine	**Slight straightening but improved**
Head position	**Slight protrusion- slight**

	forward drawn head

5.5.2 Anthropometrical measurements

- Distances of spine: table 22

Table 22. Distances of spine

Stibor's distance	11 cm
Forestier's distance	Normal
Cepoje's distance	**3 cm**
Otto's inclination dist.	**4,5 cm**
Thomayer's distance	**-5cm**

5.5.3 Gait evaluation

Step phase: normal

Stance phase: normal

Pelvis rotation: yes

Pelvis shift: yes

Trunk movement: yes

Arm sinkinesis: less than normal in both sides but with good rhythm, **no shoulder elevation and less winging of scapula**

5.5.4 Examination of basic moving patterns

The examination of basic moving patterns were provided according to *Vladimir Janda* (13)

Trunk curl up: positive

Pathological sign: Curling movement of the trunk is less in the cervical spine and the upper thoracic and the movement performed anterior tilting of the pelvis and hip flexion.

Head flexion: **positive**

Pathological sign: The movement is good but it occurs with some tremor that shows tha the deep neck flexors do not have the optimal power.

Shoulder abduction: **negative**

Activation of m.supraspinatus and m.deltoid at the beginning

Push up: **positive**

Pathological sign: During this test winging occurs but it is improved than before therapy. (scapula alata)

Extension in hip joint: positive

Pathological sign: The motion starts with the activation of humstrings muscles instead of gluteus maximus muscle and then continues to back muscles of the patient.

5.5.5 Palpation examination

Skin drag examination [13]: **No hyperalgic zones in cervical spine, and in the area between scapulas**

Examination of fascia [13]: **No restrictions of dorsal and cervical fascias.**

Palpation examination of muscles: Most of the palpation of back muscles performed in prone position which is relaxing one for these muscles . Only pectoralis minor, major, abdorminals, scalenes, SCM, iliopsoas and subboccipital muscles were examined in supine.

Table 23: Palpation of muscles

Right		**Left**
Normal tonus, no TrP **Normal tonus** Hypotonus, **no TrP**	m. trapezius upper part middle lower	**Normal tonus, no TrP** **Normal tonus** Hupotonus, **no TrP**
Normal tonus, no TrP	m. levator scapulae	**Normal tonus, no TrP**
Normal tonus	m. Rhomboidei	**Normal tonus**
normal tonus	m. subscapularis	**Normal tonus**
normal tonus	m. supraspinatus	Hypertonus
normal tonus	m. teres minor	Normal tonus
normal tonus	m. infraspinatus	Normal tonus
Hypertonus	m. scalenes	**Hypertonus**
Hypertonus, no Tarp	m. SCM	**Hypertonus, no TrP**
Normal tonous	m. pectoralis minor	Normal tonous
Normal tonus	m. pectoralis major	**Normal tonus**
Hypotonus	m. gluteus maximus	Hypotonus
Normal tonus	m. iliopsoas	**Normal tonus, no TrP**
Normal tonus	m. external oblique	Normal tonus
Normal tonus	m. internal oblique	Normal tonus
Hypertonus, no Tarp	m.suboccipitals	**Hypertonus, no TrP**
Hypertonus	m. rectus abdominis	**Hypertonus**
Hypotonus **but improved**	m. Transverse abdominis	Hypotonus **but improved**

4.5.6 R.O.M

Goniometry of active movement

Table 24. Head ROM

Right	Head	**Left**
45 °	Lateroflexion	**45 ° Improved 5 °**
80 ° Increased 10 °	Rotation	**85⁰ Improved 5 °**

Head flexion	**40 ° Improved 10 °**
Head extension	---

Table 25. Shoulder ROM

Right	Shoulder joint	**Left**
180 ° increased 5°	Flexion	**175 ° Increased 5 °**
45 °	Extension	40 °
180 ° Increased 5 °	Abduction	**180 ° Increased 10°**
70 °	Internal rotat.	70 °
90°	External rotation	**90° Increased 10°**

5.2.7 Muscle strength tests (according to KENDAL)

Table 26: Muscle strength tests

Right		**Left**
	m.trapezius	

(a)

10 **9** **8**	upper fibers middle fibers lower fibers	9 **9** **8**
9	m.rhomboideus	**9**
8	m.serratus anterior	**8**
8	m.external obliques	9
9	m.internal obliques	8
10	m.SCM	10
8	m.rectus abdominis	8
9	m.gluteus maximu	9

(b)

5.5.8 Muscle length tests

The muscle length tests were provided according to *Vladimir Janda*[8]

Table 27. Muscle length tests

(a)

Right		**Left**
0	m. trapezius upper part	**0**
0	m. levator scapulae	**0**
0	m. pectoralis minor	0
0	m/ pectoralis major	**0**
0	m. iliopsoas	**0**
1	m. SCM	1

(b)

m. suboccipitals	**1**
m. erector spinae	**0**
m. scalenii	0

5.5.9 Joint play examination

The joint play examination performed according to *Karel Lewit* [10]

Table 17: Joint play examination

Co-C1 joint	**No restriction in dorsal direction, Less restricted in**

	lateral flexion
C-Th crossing	**No restriction in lateral direction**
Acromio-clavicular joint	No restriction bilateral
Sterno-clavicular joint	No restriction bilateral
Shoulder joint	No restriction bilateral
Scapulo-thoracic joint	No restriction bilateral
Ribs	No restriction bilateral
Thoracic part of spine	No restriction bilateral

5.6 Therapy effect

After the 5 rehabilitation sessions the patient had improvements. The position of head, shoulders, scapulas is improved but still it has to be corrected more. The prominence of muscle m.SCM is not prominent, and the position of the pelvis and the lumbar spine is improved but it still exists slight anterversion. The anthropometrical measurements show the increase of the flexibility of cervical and thoracic spine. The walking of the patient has no pathological signs. The regulation of the tonus and the release of the TrP of muscles were detected by the palpation. Important improvement was that of the hypertonic muscles in neck and around scapulas (e.g m.suboccipitals, m.levator scapula, m.rhomboidei, m.SCM m.upper trapezius etc). The ROM of some joints like external rotation and abduction of shoulder and flexion of head was improved 10 degrees reaching the normal ranges. Weak muscles like m.serratus anterior, m.lower trapezius, m.rhomboidei, the deep neck flexors had increase of their power but the patient has to exercise more according to a long term plan to reach the normal power. Shortened muscles like m.erector spinae, suboccipital muscles, m.upper trapezius, m.SCM, hip flexors had an improvement in their length but the patient has to continue the autostretching to maintain and even improve it more. The mobilization of Co-C1 in dorsal direction was successful but in the lateral flexion still exists some restriction. Also the mobilization of C-Th crossing was successful and no restriction existed after the rehabilitation program.

5.7 Prognosis

Prognosis of upper crossed syndrome was very good for this patient. She had great improvement as discussed in the final kinesiologic examination of her muscle imbalances. I think if she continues the autotherapy program she will see a decrease or disappearance of neck stiffness. The time of the sessions was short and I did not deal a lot with the lower trunk. I believe that after some sessions the exercises for the stabilization of the lower part of trunk is important to make an improved posture that will not cause any more problems in the future during the activities of daily living.

6. Conclusion

I feel really happy after these two weeks of practice in the Military hospital of Prague. It was the first time I managed to use the knowledge that our university offers me in real profession conditions. Then the fact there was an improvement after these 5 sessions in the patient's situation filled me as a physiotherapist and as a person that can help others through the profession.

But the decrease of the patient's imbalances happened not only because of my personal work but also because of her great cooperation and the willing to work hard with her problem. She performed the autotherapy plan every day and was correcting it session by session after my instructions. She had positive reactions like a person and trusted my abilities from the first meeting. Without her great effort it would not be possible to see improvement in her situation.

Finally, my adviser in military hospital, assistant Marie Musilkova guided and helped me during this practice with both a professional and humanistic way which was really determining for the therapy success and for fulfilling the goals of this practice.

7. List of literature

1. Christensen K. **Manual muscle testing and postural imbalance** Dynamic Chiropractic 2000;15:2
2. Drake Richard L at al. **Gray's Anatomy for Students,** Elsevier Churchill Livingstone 2005; ISBN 0-443-06612-4
3. Ebrall Phillip S.: **Assesment of the spine** Elsevier health science 2004; p 82
4. Gray Henry: **Gray's Anatomy** (on line) 2007,(cit.25/3/2007) Available at http://www.wipikedia.org
5. **Images** (on line) 2007,(cit.17.3.2007) Available at http://www.Google.com
6. **Janda compendium**. Vol II. Minneapolis: O.P.T.P; p. 7-13.
7. Kendall F. at al. **Muscles Testing and Function.** Fourth edition.
    a. Philadelphia: Lippincott Williams & Wilkins, 1993 ISBN 0-683-004576-8
8. **Lectures of Basic Therapeutic methods** by Mgr.M.Jalovcova, Prague 2004-5 Charles University
9. **Lectures of introduction to Rehabilitation** by Mgr. J. Cemusova, Prague 2004, Charles University
10. **Lectures of Manual Therapy** by Mgr Holubarova, Prague 2005-6, Charles University
11. Lee Henry M, DC, FCCRS(C): **Rehabilitation of the proximal crossed syndrome in an elderly patient: A case report ,** JCCA 2000; 44(4); p.223–229)
12. Lewit K. **Manipulative therapy in the rehabilitation of the locomotor system**. 2nd ed. Oxford: Butterworth-Heinemann 1991;p. 79-80
13. Liebenson, Graig. at al. **Rehabilitation of the spine: A practitioner's Manual**. USA: Lippincott Williams & Wilkins, 1996 ISBN 0-683-05032-X
14. Mayer E Th , G Herrmann, V Pfaffenrath, W Pöllmann, Th Auberger **Functional radiographs of the craniocervical region and the cervical spine. A new computer-aided technique** Cephalalgia 1985;5(4);p.237–243
15. Moore Keith L. at al.. **Clinical Oriental Anatomy.** 4th edition. Toronto: Lippincott Williams & Wilkins, 1999 ISBN 0-294-38837-7

16. .Moore Michele K, DC : **Case Reports upper crossed syndrome and its relationship to cervicogenic headache,** J Manipulative Physiol Ther 2004;27; p.414-20
17. Nickleston Perry: **DC Upper Crossed Syndrome and Shoulder Pain,** 2007; 25(1);p.1-3
18. Page P. **A tribute to professor Vladimir Janda,** M.D., D.S.c The Hygenic Corporation, (on line) 2003,(cit.15.3.2007)
Available at: http://www.thera-bandacademy.com.
19. Pfaffnrath V, Dandekar R, Pollman W. **Cervicogenic headache-the clinical picture, radiological findings and hypotheses on its pathophysiology.** Headache 1987;27; p.495-9
20. Riegerová Jarmila, Pavlína Kvasničková: **Percentual frequency of the occurence of shortened and weakened muscles in the samples of men and women,** 1998; p. 1-5
21. Swartz Erik E, R. T Floyd, and Mike Cendoma: **Cervical Spine Functional Anatomy and the Biomechanics of Injury Due To Compressive Loading.** J. Ath. Train. 2005; 40(3);p.155-161