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TREATMENT OF THE SYMPTOMS AND DYSFUNCTION ASSOCIATED WITH IDIOPATHIC CERVICAL DYSTONIA BY MEANS OF POSTURAL RECONSTRUCTION PHYSIOTHERAPY.

Case Report presented by
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ABSTRACT

Postural Reconstruction Physiotherapy* was used to treat a 55 year old woman with idiopathic cervical dystonia*. Initially H.M. experienced severe neck and back pain, her head was fixed in left cervical rotation and she was impaired functionally in her ability to walk, read, sew and interact in a forward facing direction. Postural Reconstruction has enabled H.M. to return to a pain free state, resume her previous hobbies, talk to people and watch television facing forwards and walk with greater ease.

Management of people with idiopathic cervical dystonia is typically with injection of botulinum toxin (BOTOX), pharmacotherapy, behavior modification, psychology, physiotherapy and selective denervation surgical techniques. Postural Reconstruction is a physiotherapy technique developed by Francoise Mézières in which the premise is to restore morphological* alignment by normalizing excessive muscular tone*. This treatment technique has been successful for H.M. as she has improved subjectively, functionally and morphologically. Postural Reconstruction Physiotherapy therefore is an alternative conservative approach for the management of idiopathic cervical dystonia.

KEY WORDS: Postural Reconstruction, physiotherapy, idiopathic cervical dystonia, pain, Mézières, conservative management.

* an asterix after a word indicates the word is included in the glossary of terms.

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1. INTRODUCTION

This case study was performed using Postural Reconstruction Physiotherapy to ameliorate pain and improve function for H.M., a 55 year old woman with idiopathic cervical dystonia (ICD). ICD is a dystonic movement disorder in which the muscles of the neck exhibit involuntary contractions leading to sustained head deviation. (1)

Postural Reconstruction is a neuromuscular physiotherapy technique that seeks to normalize excessive tone in certain groups of muscles and improve morphological alignment while reducing pain and restoring function. (2) Prior to commencing Postural Reconstruction Physiotherapy, H.M. received direct mobilization and range of motion exercises for her neck with resultant aggravation of her neck symptoms.

The purpose of this case study was to demonstrate how using the important Postural Reconstruction Physiotherapy principle of working at a distance in the body from the areas of symptomology and dysmorphism can be effective in achieving the goals of reduced pain, decreased muscle spasm and improved functional ability.

1. WHAT IS IDIOPATHIC CERVICAL DYSTONIA?

Idiopathic cervical dystonia (ICD) is defined as “a non-congenital, involuntary focal movement disorder characterized by variable contraction of cervical spine muscles producing rhythmic, semi-rhythmic, or static distortion of head posture on the cervical spine for which an apparent etiology was not established and which has been present for at least 3 months.” In antiquity the disorder was referred to as “caput obstipum.” (3) ICD is the most common form of adult onset focal dystonia. (focal implies that symptoms occur at a local area.) (4) A patient with ICD presents with sustained involuntary twisting and turning of the neck subsequent to abnormal involuntary muscle contractions. (5) The most common presentation is rotational torticollis followed by head tilt, retrocollis and anterocollis. These patterns are not fixed and may change over time. There is no statistically significant difference between right and left deviations. (6)(7)(8)(9) One characteristic of ICD is the use of a sensory ‘trick’ or *geste antagoniste* to relieve the dystonia by touching the chin, face or head. (10) Approximately 20% of patients with cervical dystonia also have dystonia elsewhere in their bodies. The jaw (oromandibular), eyelids (blepharospasm), arm/hand (writer’s cramp) and the trunk (axial) are the most frequently affected parts of the body. (7)(8)

1. ETIOLOGY

Idiopathic cervical dystonia has not been shown to have a clear etiology. There is now clear evidence that a proportion of adult onset focal dystonia is genetically determined. (10) A significant percentage (52%) of first degree relatives of patients with focal dystonia have focal dystonia or tremor. (6)(8)(9)

Many people have relatives with other extrapyramidal disorders, most commonly tremor. Duane found that 20% of patients with torticollis had a history of significant thyroid disease, most requiring treatment. (6) There have been suggestions in the literature that dystonia can develop following peripheral trauma. In a large clinical study it was found that a history of preceding head or neck trauma occurred within months in 9-16% of patients who developed ICD. Although it is unclear how peripheral trauma produces dystonia, the fact that pain is prominent in nearly all cases of post traumatic dystonia indicate it must be an important pathogenic factor. (6) It appears that sensory input, painful or otherwise, is received by and alters the physiology of the motor system. Although it remains unknown which and how physiological changes cause dystonia (10), Molho's research indicates there may be a lesion of the basal ganglia on the contralateral side. (11) Transcranial sonography findings support the hypothesis that basal ganglia structural alterations contralateral to the side of head deviation are involved in the pathogenesis of ICD. (12)

The literature also suggests controversy about a link between ICD and psychological factors. While some authors find up to 80% of their patients have mental disease, including schizophrenia, bipolar disorder, major depression and anxiety etc, others find no difference. (9)

In the United States of America the exact incidence of ICD is unknown, but it is thought to be about 9 cases per 100,000. (4) Canadian figures for generalized dystonia are 4.2 per million people. (1) 70-90% of patients have the onset of symptoms between the fourth and sixth decades, although both children and adults can develop dystonia. (6)(7)(8)(9)

1. CLINICAL COURSE

With the condition of ICD, patients report a worsening of their symptoms for 3-5 years at which time the symptoms tend to stabilize. (13) Although the dystonia may segmentally spread to other parts of the body or a person may develop essential tremor, it does not become generalized. (10) As a result of the head position, patients may develop cervical spondylosis with resultant radiculopathy or myelopathy. (14)

When pure ICD populations are studied for complete or partial remission unrelated to medication, remission rates of 10-20% are found. (15)(16) Generally, those who develop ICD at a young age are more likely to experience remission. However, nearly all patients relapse within 5 years leading to a cycle of remission and relapse. (6)

1. **CLINICAL PRESENTATION**

5.1 Functional Disability

Patients with ICD can present with various manifestations that contribute to disability. (10) Functionally they may not be able to drive; may avoid social interactions due to their abnormal head posturing; be limited with bimanual activities requiring specific visual input, for example sewing, playing the piano and cooking; and they find it difficult to walk long distances since they are not able to easily look straight ahead. Golf, racquet sports and lifting weights are examples of activities that may aggravate the pain and muscle spasm.

5.2 Pain

Approximately 75% of patients with ICD experience pain at some point of their illness. This is considered a major source of disability for them. (13)(16)(7)(8) Typically patients experience widespread and diffuse myofascial pain in the neck and shoulders with some radiation down the arm predominantly on the side to which the head rotates and radiation of the pain up the ipsilateral side of the neck and head. (17)

In Chan's et al's review of clinical features of ICD in 1991 (7), they found that pain was strongly associated with constant (rather than intermittent) head turning, with the severity of head turning and with the presence of muscle spasm of the contralateral sternocleidomastoid, levator scapulae, ipsilateral splenius capitus and ipsilateral or contralateral trapezius muscles. However, Kutvonen et al (18) studied muscular pain and muscle tenderness using palpation in people with dystonia and in control subjects and were unable to conclude that pain does not solely originate in the muscles involved (sternocleidomastoid, trapezius and splenius capitus). They propose that ill-understood central mechanisms must also be involved in the pain experienced.

During sleep, Lobbezoo et al (19), reported abnormal cervical muscle activity of the sternocleidomastoid and trapezius muscles using electromyography (EMG). In addition,

they noted that cervical spinal pain and unpleasantness were reduced during overnight sleep. These results are similar for other movement disorders, i.e Parkinson's disease and Huntington's disease. (20)

5.3 Depression

Depression prevalence has been found to be greater than average in people with ICD, often secondary to embarrassment about their body image and degree of disability. As symptoms improve, depression scores can improve. (21)

5.4 Balance

Dynamic balance especially with the patient's eyes closed (versus eyes open) is reduced in patients with ICD. Balance depends on multiple sensory inputs (from visual, proprioceptive and vestibular systems), integrative brain centers and motor output. (22) Vision is preserved (23), whereas neck proprioceptive input and vestibular ocular reflex are affected in patients with ICD. (24)

5.5 Spatial Orientation

Patients with ICD tend to use their trunks instead of their head and neck position for reference of visual straight ahead. When patients walk, they do not deviate from an intended path direction, indicating they rely more on their trunks for orientation. (25) In terms of upright visual vertical posturing, the pathological deviation in ICD becomes accepted as upright posture and visual vertical and facial orientation are estimated as if the head were upright. They also use their trunks for a reference point instead of neck proprioceptive or vestibular signals. (26)

6. MANAGEMENT

Management of ICD involves providing symptomatic relief, improvement of the quality of life and prevention of secondary complications. There is no universally accepted treatment protocol as there is no cure as yet for ICD. Some of the common treatment approaches used are as follows:

6.1 Physiotherapy

Physiotherapy is important for: pain management using modalities such as transcutaneous electrical nerve stimulation (TENS); postural awareness and re-education; and general conditioning with, for example, aquatic therapy and body mechanics.

6.2 Massage therapy

Massage therapy is used for pain and muscle spasm relief through soft tissue mobilization.

6.3 Acupuncture

Acupuncture can be used for pain relief by balancing meridian energy.

6.4 Feldenkrais

Feldenkrais is an approach used to help break the pain cycle using awareness through movement and integration of healthier movement patterns.

6.5 Trager

Trager can be used for relaxation and movement re-education by releasing deeply ingrained mind-body patterns.

6.6 Botulinum Toxin

Botulinum Toxin (BOTOX) is injected into muscles (most commonly sternocleidomastoid, trapezius, splenius capitus and levator scapula) to provide chemodenervation and thereby decrease chronic muscle spasms, improve posture and reduce pain. Injections may be repeated every 3-4 months, as the potential results are temporary and inconsistent. (10) A new strain of the toxin is being developed that is currently unavailable.

6.7 Pharmacological Therapy

Anticholinergics, benzodiazepines, baclofen, tegretol, tetrabenazine and diphenhydramine can be effective for some patients. Sometimes they are used in conjunction with BOTOX to reduce the neutralizing effects of repeated injections. (10)

6.8 Dorsal cord stimulation

Dorsal cord stimulation is used to alter abnormal tonic neck reflexes by interrupting the afferent input of the reflex arc. If successful, some people have permanent stimulators inserted surgically. (28)

6.9 Surgery

If a condition is unresponsive to medication and BOTOX injections, and is associated with significant chronic pain and disability, surgery may be indicated. (10) Peripheral denervation procedures for dystonic muscles are the most widely practiced surgical procedures. Care is taken to eliminate pathological activity while preserving normal motor function. (29)

6.10 EMG Biofeedback

Electromyelography (EMG) biofeedback is used for muscular relaxation and retraining of muscles.

6.11 EEG Biofeedback

Through brain wave electroencephalography (EEG) biofeedback, patients can learn to consciously manipulate and improve dysfunctional brain wave patterns.

6.12 Psychology

Psychological counseling is important for depression; family and caregiver support; and coping strategies for pain, change in body image and disability.

Behaviour therapy is used to provide biofeedback, visual feedback, positive practice, massed negative practice and hypnosis. (27)

6.13 Dystonia Support Groups

Dystonia support groups allow people with ICD to meet other people with the same disease process for further education and support.

7. POSTURAL RECONSTRUCTION

7.1 Overview

H.M. has been receiving Postural Reconstruction Physiotherapy treatment since 1997 for the symptoms and dysfunction experienced due to her idiopathic cervical dystonia.

Postural Reconstruction is a physiotherapy technique that works to normalize the muscular tone of the entire body thereby potentially improving the morphological alignment. The term 'tone' is the physiological level of activity in muscles and chains of muscles. Hypertonicity is an elevation of this tone. (2) The underlying theory was developed by French physiotherapist, Francoise Mézières, in 1949. In the past 50 years, physiotherapists, primarily in France, Switzerland, United States and Canada, continue to expand the theoretical framework of Postural Reconstruction.

7.2 Principles

Postural Reconstruction Physiotherapy takes into account the following principles:

7.2.1 Muscular chains

There are four muscular chains in the body. A chain is a set of polyarticular muscles that follow each other and overlap in the same direction, like tiles on a roof, with no break in continuity forming a single system. (2)(30)

Over a person's lifetime these muscular chains accumulate excessive tone and become hypertonic in response to normal activity and various traumas. The trauma can be physical, emotional, psychological, thermal, hormonal or infectious. As a result of the hypertonicity, the muscular chains become shorter and less flexible thus altering the biomechanics of the soft tissues and the joints. As a further result of the hypertonic muscular chains, the body develops dysmorphic alignment which often leads to symptomology and dysfunction. (2)

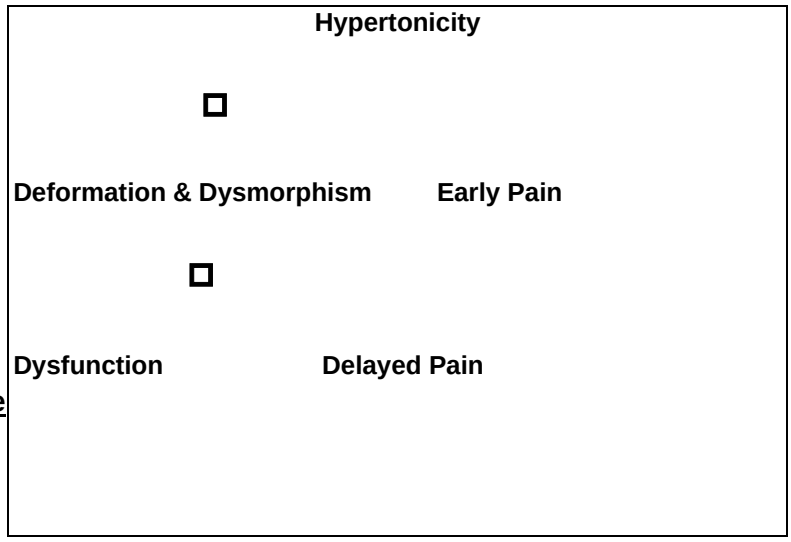
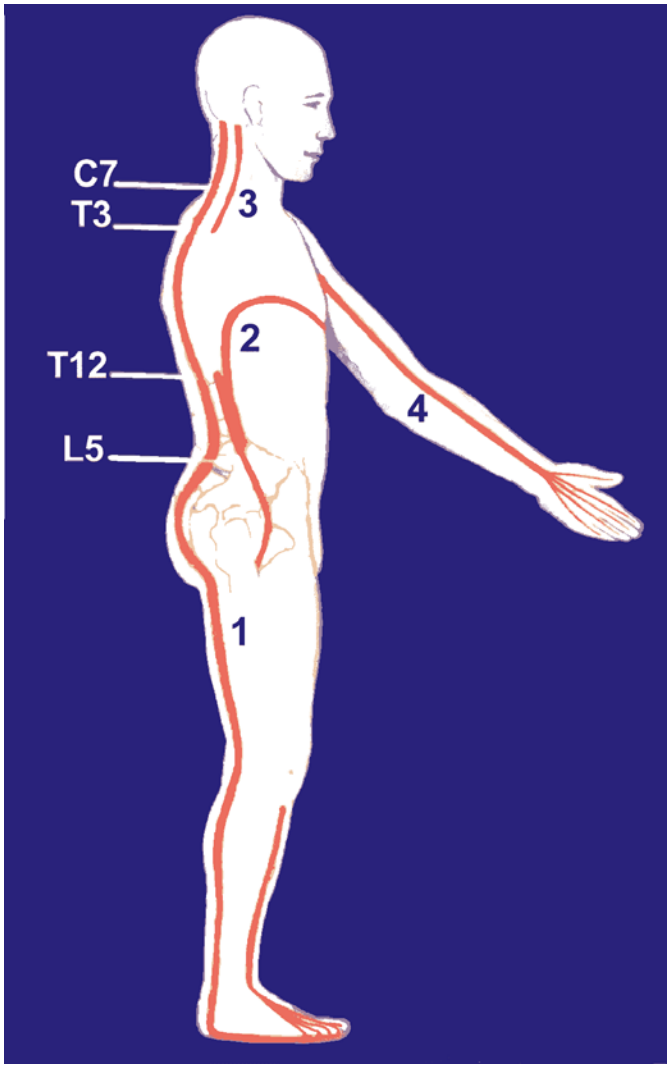


Figure 1. Hypertonicity and its possible sequellae (31)

1. **The 4 muscular chains in the body are shown in Figure 2. (2)(30)posterior corporeal chain discovered by Francoise Mézières**
2. **anterior chain of the lumbar area discovered by Francoise Mézières**
3. **anterior chain of the neck discovered by Michael Nisand**



4. **brachial chain discovered by Francoise Mézières**

Figure 2. The four muscle chains

7.2.2 Chronic hypertonicity

Chronic hypertonicity leads to morphological deformations and dysfunction. Over time the musculo-skeletal system distorts in response to hypertonicity of the muscular chains. The deformations, referred to as postural dysmorphisms*, tend to follow pre-determined laws as identified by Francoise Mézières:

7.2.2.1 Shortening of the chains

Any localized lengthening or shortening movements are possible only with compensatory shortening of the muscular chains elsewhere in the body, often at a distance from the attempted movement. Muscular shortening throughout the system and restricted range of movement are thus subsequent to increased tone. (2)(30)

7.2.2.2 Tri-planar deformations

Any effort to counteract the systemic shortening results in latero-flexion and rotation of the spine and limbs. Within a muscular chain, the muscles are polyarticular, located anterior, posterior and lateral to the spine and follow oblique trajectories. They work together to perform movements in three planes; frontal, sagittal and horiztontal. The dysmorphic deformations therefore occur in all three planes and must be taken into account for lengthening of a muscular chain to occur. (2)(30)

7.2.2.3 Medial rotation

The limbs tend to rotate medially. When observing a person standing with their medial borders of the feet touching, one always sees the hands by the side of the body in a slightly pronated position. In addition, the medial condyles of the femurs are always more prominent than the lateral femoral condyles when observed from the posterior aspect. (2)(30)

7.2.3 Normalizing muscle tone

Amelioration of dysmorphisms occurs through morphological reconstruction by normalizing the excessive muscular tone.

Evaluation with Postural Reconstruction Physiotherapy involves a comprehensive static morphological assessment to determine the shape of the rib cage, shape of the pelvis, limb position, overall alignment of body masses, specifics of lordotic depth and direction and other areas of asymmetry or deformation. The static assessment is supplemented by a dynamic

assessment in which the patient performs maneuvers* that create tension in the muscular chains and maneuvers that place active demands on them. (32)

To correct targeted dysmorphisms, Postural Reconstruction Physiotherapy uses therapeutic postures*. The patient actively holds a specific voluntary active inductive trigger (AIT)* that evokes an automatic voluntary or involuntary evoked response (ER)* elsewhere in the body. (33) As the AIT evokes a response distally, over time there is a corresponding exhaustion of the induced hypertonicity and a reduction of the deformations. As the tone is normalized, the muscles regain their length resulting in improved flexibility and alignment. (31)

7.2.4 Breathing

Breathing is an essential component of Postural Reconstruction treatment. The anterior chain of the lumbar spine is composed of 2 muscles, the iliopsoas and the diaphragm. With effort involved in assuming and maintaining the AIT, the diaphragm can become increasingly hypertonic causing a blockage of breathing during inspiration. This locking facilitates the thoraco-lumbar lordosis and must be eliminated or the therapeutic posture will fail. The efficiency of treatment is enhanced by having the patient perform a 'working breath' which has functional and morphological characteristics:

functional: the exhalation must be free, regular, complete and performed with an open mouth;

morphological: at the end of each exhalation, the thoracic and abdominal contours must be as close as possible to ideal in shape. In the ideal alignment of the paragon*, the lateral lines of the thorax and abdomen are straight and oblique and the anterior line from the sternum to the xiphiod process approaches 45° while the line from the xiphoid process to the pubic bone angles posteriorly in a straight and oblique manner.

Postural Reconstruction breathing helps avoid inspiratory apnea, aids the physiotherapist in monitoring the increased tone of the muscular chains and attempts to remove involuntary contractions* of the diaphragm. (30)

7.2.5 Work at a distance

As mentioned in 7.2.3, Postural Reconstruction Physiotherapy treatment uses therapeutic postures to ameliorate dysmorphisms. The postures are developed based on:

1. the location of the dysmorphisms observed during the morphological evaluation.
2. the observations resulting from maneuvers that create tension and maneuvers that place active demand on the muscular chains.
3. the location of symptomology. (32)

The most efficient way to release hypertonicity is to work at a distance (in another part of the body far away) from the target area of distortion or algia, as the speed of exhaustion of the induced excessive tone appears to be proportional to the distance between AIT and the targeted dysmorphism. (32)

7.2.6 Lordoses, Arrows and Pillars

The static and dynamic aspects of the evaluation objectify the spontaneous and induced dysmorphisms of the patient. A Postural Reconstruction physiotherapist focuses most on the lordoses as the other dysmorphisms of the limbs are the consequences of these lordoses. In order to improve the morphology, reduce the symptomology and improve function for a patient, it is necessary to normalize the muscular tone, especially in the posterior muscles that contribute to increasing the lordoses.

To aid the understanding of the lordoses and their consequences, Postural Reconstructionists describe the orientation of the lordoses. Each lordosis is considered to have an apex that can be likened to a virtual arrow traversing through the body with the lordosis as the bow of the arrow. Typically the arrow entrance is from the posterior or postero-lateral aspect of the body and the exit is in the anterior or antero-lateral aspect of the body.

In addition to orientation of lordoses described by arrows, the Postural Reconstructionist refers to pillars. A lordosis is physically defined by a superior and an inferior pillar which are usually the most prominent aspects of the patient's morphology compared to the ideal alignment of the paragon. Similarly, the span of a bridge is defined by two pillars.

8. CASE STUDY – PATIENT H.M.

8.1 Evaluation

Patient H.M. was referred to me for Postural Reconstruction Physiotherapy by her massage therapist. Her initial assessment and treatment commenced on August 6th, 1997.

8.1.1 History

8.1.1.1 History of present illness

H.M was diagnosed with ICD by her neurologist in 1994, at the age of 49. The onset of her symptoms were gradual over a period of 9-12 months before the diagnosis was made. She denied any trauma (cervical or otherwise) prior to the onset. Initially her head was held slightly rotated towards the left. The degree and persistence of rotation increased over the first 2 years, as her muscles became so strong she could no longer control the rotation of her head towards the left. She has not experienced any periods of remission.

8.1.1.2 Family history

H.M.'s mother died at 89 years of age after having been diagnosed with Myasthenia Gravis since 85 years of age. Her mother's brother had a degenerative neurological disease and her mother's sisters suffered from migraine headaches in addition to strong allergies to

substances like wool. H.M.'s cousin had a hemifacial spasm that has been relieved with BOTOX injections.

8.1.1.3 Treatment history

H.M. did not have an MRI or cat scan. For pharmacologic treatment of ICD, H.M. took the following medications with varying success:

ARTANE – for 10 days only, since she felt very disoriented with reduced concentration and poor judgement.

MEXATIL – unbenefical. Dizziness was brought on by change in head position.

RIVOTRIL – ¼ - ½ mg per night. When she temporarily weaned herself off this medication, there was not a marked change in her symptoms.

H.M. received BOTOX injections to her right sternocleidomastoid and left upper trapezius muscles without any relief. She will consider future BOTOX treatment when a new strain becomes available. H.M. had experienced temporary relief of the muscular tension with regular, weekly massage therapy. Conventional physiotherapy with direct neck mobilization, cervical range of motion and neuromuscular electrical stimulation increased her pain and increased the elevation of her shoulders. Acupuncture, spiritual healing and healing touch were alternative remedies she tried without symptomatic improvement.

8.1.2 Subjective Status

On initial evaluation, H.M.'s primary complaint was of severe pain and muscle tightness on the lateral aspect of the right side of her neck. There was pain and increased muscle tension in the superior aspect of the shoulders by the upper trapezius muscles bilaterally, pain at the cervico-thoracic junction, pain medial to the inferior aspect of her right scapula and right lumbar

pain. Her head was rotated to the left with mild left laterocollis and neither a predominance of anteversion or retroversion. Although her head position was not fixed, it was very difficult for her to rotate her head to the right. She states she did have some cervical tremor which stopped during sleep. Her sleep otherwise was reported as “not great, but O.K.” H.M. denied having tremor, dystonia, headaches or pain elsewhere in her body. As is characteristic of patients with ICD, H.M. used a *geste antagoniste* to relieve her dystonia by holding her chin with her left hand especially when talking to other people and walking.

Additional symptoms included chronic constipation, varicose veins and chronically swollen ankles. She wore support hose for her varicose veins daily and on weekends when standing and walking activities were performed. Psychologically H.M. did not feel embarrassed by her appearance and did not claim to be depressed about her decline in functional status.

8.1.3 Functional Status

H.M. works full-time as a geophysical technologist. This employment requires sitting at a computer terminal for the majority of the day. She used to be able to walk for miles without any consequences but at the time of evaluation, she found it tiring to walk any distance because it was difficult to see where she was going. She used her left hand to hold her head straight which eliminated arm swing. Reading was difficult as she could not find a comfortable position. To watch television or talk to people, she often turned her chair towards the right. Using a sewing machine and doing needlepoint sewing were hobbies that had become almost impossible for her since she would experience increased pain and discomfort from awkward positioning. She stopped playing the piano. In 1993, H.M. hired a cleaning person to do housework. For driving, H.M. wore a soft support collar all the time, leaned her head against the head rest and made increased use of her mirrors.

8.1.4 Morphological Evaluation

8.1.4.1 Static standing

H.M. was asked to stand with her feet together away from the wall to assess her body's spontaneous deformations. Refer to Appendix I for photographs of the static standing morphological assessment. On August 6th, 1997, she presented with the following:

1. marked cervical rotation to the left
2. mild side flexion of the head to the left
3. left shoulder higher than the right
4. bilaterally increased upper trapezius muscle tension
5. internal rotation of the humerus in the right glenohumeral joint
6. right arm markedly pulled posterior of her torso
7. left shoulder anterior of right shoulder with left palm facing backwards
8. marked prominence at the cervico-thoracic spinal junction
9. medial part of the right clavicle more prominent
10. sternal prominence near the manubrio-sternal junction
11. left nipple more superior than right
12. right scapula anteriorly tilted
13. right scapula adducted and depressed
14. smaller left thoraco-brachial* space both in width and length
15. right waist crease deeper than left with an additional crease inferior to right scapula
16. bilaterally, the anterior, inferior segments of the ribs were prominent
17. left ASIS* displaced anterior and superior in relation to the right ASIS
18. pelvis appeared shifted towards the right relative to midline of the body
19. markedly increased thoraco-lumbar lordosis
20. entire right buttock and leg posterior of left buttock and leg when viewed from the side
21. mild recurvatum of both legs
22. solid contact of legs at upper thighs and knees, mild contact at calves and solid contact at the medial malleoli
23. slight hallux valgus on the left foot

8.1.4.2 Forward bend plantigrade test H.M. bent over and placed her hands on the floor with her head and trunk located within the base of support defined by her feet and hands. She presented with a cervico-thoracic convexity on the left, short right lower thoracic (T9 - T11) convexity and a lumbar convexity on the left.

8.1.4.3 Standing against the wall

H.M. stood against the wall ensuring contact of her heels. No contact was made with her head. There was markedly greater contact of her right calf, right buttock and right scapula with only the inferior aspect of her left scapula contacting the wall. After each treatment session, H.M. stood against the wall again to evaluate the immediate effects of the treatment. This was added to the classic assessment to aid H.M.'s appreciation of the changes in her alignment.

8.1.4.4 Palpation of cervical vertebrae

Palpation of her cervical spine was possible considering H.M.'s head position was not fixed. In supine C2 + C3 articular processes were palpated to the right of midline. C4 – 6 articular processes were palpated to the left of midline and C7 – T1 spinous processes were palpated to the left of midline. T2 – T3 spinous processes were palpated to the right of midline indicating an upper right cervical convexity and possibly a cervico-thoracic convexity on the left. H.M presented with an upper cervical kyphosis.

8.1.5 Dynamic Assessment

The static aspect of the evaluation was followed by the dynamic in which maneuvers were performed to increase the tone in the muscular chains and to place active demands on the trunk and limbs. The resultant morphological changes further identified the dysmorphisms observed during the static assessment.

The dynamic assessment was performed over the first two treatments; August 6th, 1997 and August 13th, 1997.

Although this evaluative tool is not part of the routine Postural Reconstruction assessment, active cervical rotation was performed in sitting to evaluate her ability to rotate her head without her head contacting the mat on the floor.

_ right rotation - 1/4 of normal (90°) range of motion

_ left rotation - full range of motion

_ right side flexion was ½ and left side flexion was ¾ of normal range of motion (45°)

The following aspects of the dynamic evaluation were performed in supine on a ½ inch mat on the floor:

_ cervical rotation and cervical side flexion were deferred secondary to H.M.'s previous experience of markedly increased pain with direct cervical range of motion and mobilization during treatment with conventional physiotherapy.

_ active left arm abduction with internal rotation of the glenohumeral joint – evoked a widening of her left hemi-thorax (with the apex of the concavity at approximately T11) in the frontal plane and produced elevation of her right ASIS towards her ribs, indicative of a right lumbar concavity.

_ active right arm abduction did not produce any interesting morphological modifications.

_ active flexion of the left shoulder with external rotation of the glenohumeral joint and the arm maintained in supination evoked elevation of the lower half of her thorax centrally in the sagittal plane.

- active right shoulder flexion with external rotation of the glenohumeral joint evoked inferior right rib prominence in the sagittal plane. This was considered a confirmation of the right lower arrow exit point. She felt an unusual sensation on the side of her head.

_ passive flexion of the right hip with the knee in extension evoked pelvic pseudo-rotation towards the left.

_ passive flexion of the left hip with the knee in extension evoked lifting of both buttocks.

_ passive flexion of both hips with both knees in extension evoked inferior right rib prominence in the sagittal plane and left anterior hemi-thorax prominence in the sagittal plane. This result confirms the inferior arrow exit at the right inferior rib. With bilateral hip flexion the left leg appeared much longer than the right compared to only mildly longer than the right in supine. This disparity was due to a pseudo-rotation of the pelvis caused by a lifting of the left pelvis.

Posterior View

Summary of the results of the static and dynamic evaluation:

1. upper arrow entrance is from the right, tilting the right scapula anteriorly.2. upper arrow exit is lateral below the left nipple increasing the thoracic deviation to the left in the frontal plane.

3. lower arrow entry is from the right with the apex in the thoraco-lumbar lordosis.

4. lower arrow exit is on the right at the inferior ribs. This rare finding was verified with right abduction and bilateral hip flexion both increasing this prominence as an exit point.

Figure 3. Summary of morphological presentation of H.M.

Pillars - upper - inferior right scapula.

- lower - mid right calf more than left mid calf.

8.1.6 Ankle circumference On August 13, 1997, ankle measurements around the malleoli were taken in supine after a full day of work . The right was 9 ¾ inches and the left was 10 inches.

8.2 Treatment

8.2.1 Goals of Treatment

For H.M., Postural Reconstruction Physiotherapy subjective and functional treatment goals were:

1. reduction in her neck and thoracic pain
2. reduction in the muscular hypertonicity , especially in her neck to ease the chronic left cervical rotation and sensation of tightness

3.increased walking distance and duration

4. improvement in reading comfort

5.return to sewing, needlepoint and piano playing

6.elimination of soft collar use when driving

In addition to the specific goals, H.M. was hoping for the following symptomatic improvements:

1. reduce the chronic swelling of her ankles measurable by ankle circumference changes
2. reduced wearing of support hose stockings for varicose veins
3. relief of constipation

8.2.2 Approach and Progression of Treatment

H.M.'s treatment began on August 6th, 1997 and continued weekly for 12 sessions until October 22nd, 1997. At that time the treatments became every 2 weeks until February 11th, 1998; every 3 weeks until March 3rd, 1998; monthly until April 29th, 1998; and every 6-8 weeks until the present.

The primary goal of the treatment approach was to demonstrate the effectiveness of the principle of working at a distance from her cervical area where the majority of her pain and dysfunction were emanating. During the initial 18 sessions, postures using cervical rotation or cervical lateral flexion were avoided to:

1. prevent aggravation of her symptoms as she experienced exacerbation with previous physiotherapy involving direct work with her neck
2. ascertain the results of working at a distance from her area of symptomology.

To improve the understanding of morphology, Postural Reconstruction theoretically divides the body into an upper block and a lower block. The upper functional block is composed of the head, spinal column to T7, anterior chain of the neck, the shoulder girdle, the upper extremities with the brachial chain and the posterior chain to T7. The lower functional block is composed of the posterior chain from T7 inferiorly, pelvis, lower extremities and the anterior chain of the lumbar spine. (33) For H.M., the two primary target areas were:

1. the cervical spine in the upper block
2. the right thoraco-lumbar lordosis in the lower block

To therapeutically evoke a response and reduce the hypertonicity in the upper block by aggravating the dysmorphism in the cervical spine, two lower block maneuvers were primarily used:

1. bilateral hip flexion in supine with ankle movement
2. the sitting posture with the inductive maneuvers in the lower block.

To install the first posture, H.M. was supine and her lower extremities were passively flexed to enable the knee and ankle malleoli to be vertically aligned over the apex of the thoraco-lumbar lordosis with slight knee flexion. During the AIT it was critical for H.M. to actively maintain external rotation of the femurs while systematically plantar flexing and dorsi flexing the ankles in conjunction with inspiration and expiration respectively. At first, she performed this maneuver with the feet abducted and progressed to alternating between abduction and adduction at the talo-crural joint. (35) Initially her expiration was blocked with this posture and required proprioceptive tactile feedback of the physiotherapist's foot lightly placed inferior to her xiphoid process.

The sitting posture found to be the most effective initially at reducing the cervical hypertonicity was performing maximal femur external rotation with the middle of the calcanei resting on the floor as the AIT. To install these sitting postures, H.M. was brought passively from supine to sitting by the therapist. The arms were flexed in front of her body to approximately 80 ° while she cupped the contralateral elbow in her hand and abducted the scapulae. She flexed her torso forward at the hips trying to maintain the scapulae and sacrum as vertically aligned as possible. She exhibited less left cervical rotation and her head was in midline temporarily during the morphological assessments after treatment. By the eleventh treatment, the treatment induction was modified to include right shoulder flexion (with maximal glenohumeral external rotation) combined with flexion of the left hip. After treatments the right shoulder became less posteriorly depressed as the shoulder heights became more equal.

The next progression of the sitting position was to add resisted extension of the toes as the AIT. In the seated position, H.M. installed the posture by crossing the arms with the hands

on the contralateral scapulae and flexed her torso forward at the hips. The left leg was flexed until the heel was level with the opposite tibial fossa. H.M. was asked to extend the left toes against the physiotherapist's resistance while maintaining the ankle in neutral, and the third toe, knee, hip and humeral head in alignment. (33) This posture can be very effective in reducing the hypertonicity in the anterior chain of the neck. (33) In H.M.'s case, she experienced greater ease in keeping the head in midline against the wall during the post treatment standing against the wall assessment and at home when watching television.

In order to aggravate the second target area (the right thoraco- lumbar lordosis in the lower block) to subsequently produce a reduction in the tone, these upper block postures used for treatment:

1. right shoulder flexion in supine
2. bilateral wrist maneuvers in supine

To perform right shoulder flexion in supine, H.M. was asked to install this posture by raising the right upper extremity to vertical and actively distract the shoulder while maintaining maximal external rotation of the glenohumeral joint with assistance by the physiotherapist. During the AIT care was taken to keep the third finger, wrist, elbow, middle of the shoulder and middle of the right hip in alignment. It was also critical to lift the right scapula off the ground to prevent it from resting or pushing on the floor, and to relax involuntary contractions of the left shoulder girdle muscles (primarily the latissimus dorsi). (34)

To install the bilateral wrist maneuvers, H.M. was supine with both arms abducted to approximately 85 °. Assistance was provided for maintaining maximal internal rotation of both glenohumeral joints throughout the three inductive phases of the posture. In the first phase H.M. was required to supinate the forearms with the palms open and the fingers together. Care was taken to keep the thumbs abducted away from the palm. The second phase involved flexion of the distal and proximal interphalangeal joints, flexion of the wrists, flexion of the thumbs to rest the medial aspect of the distal phalanxes on the distal phalanxes of the second fingers while abducting the proximal phalanxes of the thumbs and radially deviating the wrists to neutral. For

the third phase, H.M. performed bilateral wrist extension with the fingers extended, the thumbs abducted away from the palms and the volar surface of the forearms maintaining a position close to the mat.

By the eighteenth treatment, H.M. was consistently reporting reduced neck pain, decreased muscle pull to left rotation, increased ease of keeping her head straight against a high back chair when watching television and was beginning to be able to actively rotate her head to the right. Cervical side flexion to each side was introduced as treatment at this time. Left cervical side flexion evoked left hip hiking while right side flexion increased the right anterior hemi thorax prominence in the sagittal plane. Since H.M. did not experience an aggravation of her neck pain, cervical rotation as a treatment was introduced on the nineteenth session. Active assisted cervical rotation to the right was limited to one third of normal range of motion (90 °). By the thirty third treatment, H.M. was able to rotate her head to the right ½-¾ of normal range of motion with active assistance.

8.3 Results

The results of Postural Reconstruction Physiotherapy for H.M. are summarized in Table 8.3.1. The results have been separated into subjective, functional and morphological improvements. Refer to Appendix I for photographs of H.M. taken at the second, twelfth and thirtieth treatments.

8.3.1 Table of Results continued

Initial Evaluation	6 Treatments	12 Treatments
♦ arked elevation of left shoulder ♦ ilaterally increased upper trapezius muscle tension ♦ ight arm markedly pulled posterior of torso ♦ arked cervico- thoracic prominence ♦ osterior depression of right scapula ♦ eft shoulder anterior of right ♦ eft ASIS anterior of right ♦ eft pelvis hiked ♦ elvis shifted right ♦ severe pain and markedly increase thoraco-lumbar lordosis ♦ pain medial to inferior right scapula ♦ right lumbar pain ♦ marked cervical rotation left ♦ servical tremor ♦ chronic constipation ♦ ead 2 inches away from the wall ♦ varicose veins chronically swollen ankles at malleoli: R. 9 ¾ in, L. 10 in	♦ eft shoulder elevated ♦ ecreasing pull posteriorly of right arm ♦ educing cervico-thoracic prominence ♦ educing posterior depression of right scapula ♦ ight and left ASIS's in line most of the time ♦ liac crests level some of the time ♦ decreasing muscle tension in SCM ♦ educing right pelvic shift ♦ ight scapula and buttock closer to wall than left. Calves equal ♦ ble to touch head against wall	♦ houlders level so ♦ nferior scapulae ♦ eft shoulder sligh right ♦ educing thoraco- ♦ egs equal from th the time ♦ qual contact agai scapulae, buttocl decreased low back pain onset of cervical rotation to left is later in the day reduced constipation, no longer taking laxatives ankle measurements R. 9 ¾ in, L. 9 5/8 in increased energy level
sleep is disturbed unable to walk any distance as she couldn't see where she was going no arm swing during gait unable to be comfortable reading turned chair to right to watch T.V. or to talk to people unable to sew or do needle point unable to play piano wore a cervical soft collar for driving wore support hose daily for varicose veins	- able to read in bed for 1 hour feels straighter and more comfortable sitting in a chair	able to stand 1 hour without support stockings at work and reduced wearing of stockings on weekends

8.3.1 Table of Results

9. CONCLUSION

Idiopathic Cervical Dystonia can be a very disabling disease process due to the chronic muscle spasm, pain, head position and loss of functional ability. In H.M.'s case she was experiencing all of the above effects in addition to varicose veins and chronic constipation. Although many people are depressed about their body image and reduced functional ability, H.M. did not express those concerns.

Postural Reconstruction Physiotherapy was used as a treatment modality for H.M. as she was experiencing limited relief with other treatment approaches including medication, BOTOX injections, conventional physiotherapy, massage therapy, acupuncture and spiritual healing.

The treatment approach of working at a distance from her cervical spine where the concentration of her pain and muscle spasm were located, proved to be beneficial subjectively, functionally and morphologically within the first 18 treatments. Before cervical maneuvers were employed, H.M. was experiencing reduced neck pain, decreased muscle spasm and a progressive reduction in the strong pull of her neck into left cervical rotation. H.M. also experienced a reduction in her chronic constipation.

Functionally, within the first eighteen treatments, H.M. reported increased comfort with reading, sitting in a chair and talking to people and watching television. Walking became easier since she could face forward for longer periods. Additionally, improvement in her varicose veins was evident as she relied less on support stockings and there was a reduction in her ankle circumference measurements.

By reducing the depth of her thoraco-lumbar curve, the rest of her alignment improved. Morphologically, she presented with decreased cervical rotation of the left, inferior angles of her scapulae at equal heights, reducing cervico-thoracic prominence, less pulling of her right arm posteriorly as it became positioned by her side and improved pelvic symmetry. By the thirtieth

treatment, five of her six treatment goals were achieved and her three additional symptoms improved. She still wears her cervical collar occasionally to drive.

The conventional methods of management of ICD outlined in chapter six aim to provide symptomatic relief. Postural Reconstruction Physiotherapy is different in that the premise is to provide symptomatic, functional and morphological changes through the neuromuscular release of chronic muscular hypertonicity. Pain and dysfunction are associated with an accumulation of muscular tonicity. The results H.M. experienced of significant pain reduction, decreased muscle spasm and restoration of function that have continued over two and a half years indicate that Postural Reconstruction Physiotherapy is a beneficial, progressive method of long term management of ICD. Although the effectiveness of the important Postural Reconstruction Physiotherapy principle of working at a distance in the body from the area of symptomology and dysfunction was demonstrated in this particular single case study, one case is not enough to draw unanimous conclusion for all people with ICD. H.M.'s life has been greatly enhanced as she can walk easier, return to doing some of her hobbies and no longer has pain in her back, shoulders, neck or head.

Postural Reconstruction Physiotherapy can best be summarized by Francoise Mézières: "Restore the form to regain the function." (2)

10. PERSONAL ACCOUNT FROM PATIENT H.M.

In 1994, just before my 50th birthday, I was diagnosed with Spasmodic Torticollis, (Idiopathic Cervical Dystonia) a form of dystonia, in my neck. I'd had the condition for about nine months by then but nobody had been able to tell me what the problem was.

It began to take a great deal of effort to keep my head facing forwards, as it wanted to turn to the left all the time. As time went on the muscles pulling my head to the left became so strong that I could no longer control them and spent most of my time looking to the left. To compensate for this I started to hunch my shoulders, and to stand sideways so that I was looking where I wanted to look. The muscles in my upper back, shoulders, neck and the back of my head became extremely tight, and I had a lot of pain. The pain was worst in the back of my head and the top of my spine between the shoulders.

Everyday activities were very difficult. I could not see where I was walking, so unless I used my left hand to push my head round to forward position so that I could see where I was going. I stumbled and bumped into things a lot! I never swung my arms as I walked because they were too occupied with my head! I have always enjoyed sewing and embroidery and found it almost impossible because I had to get myself into an odd contorted position so that I could see what I was trying to work on, and after doing that for any length of time, was in great pain and discomfort. I also enjoy reading but could only read comfortably lying down. Writing was difficult, but possible. Somehow using a computer was easier, so I have been able to keep working. I stopped playing the piano.

A separate issue is that I have poor circulation and varicose veins

I tried various alternative remedies for my neck, as the medical profession seemed unable to help me. I went to two acupuncturists; a spiritual healer; healing touch and two regular physiotherapists. The physiotherapists actually made me worse. They used electrical impulse machines on me, and for days after the treatment my shoulders were all hunched up and I was in quite a bit of pain.

I joined the Calgary group for dystonia. Surprisingly we have about a hundred members, so dystonia is not unusual as one would first think. Everyone there complained about the severe pain their dystonia caused them. A woman at the group, who has dystonia in the same place as me, recommended a masseur, and I found that massage gave good temporary relief.

The masseur told me that a Postural Reconstruction Physiotherapist was joining their staff, and that she may be able to give me some relief. So my visits to Diane began.

Diane found my right shoulder had dropped, and my left was forward, and the muscles in my neck were so tight that it was impossible for me to relax for more than a few seconds.

At first my appointments were every week, then every two weeks, then once a month and now every six weeks.

We have made a lot of progress! The dystonia is not cured – Diane never claimed that she could cure it, but it is now manageable. I can walk comfortably and safely, and swing my arms, as I do not always have to hold my head. I can sew for hours without adverse effects, and occasionally I get back to piano lessons (I am just a beginner).

An added bonus is that I no longer have to wear support hose all the time, as my legs rarely ache from varicose veins.

But best of all, I have no pain in my back, shoulders, neck or head.

11. GLOSSARY

active inductive trigger (AIT) - This technique involves placing a localized active trigger maneuver in the maximal possible range of motion in order to induce excessive muscular tone at a distance (in another part of the body located far away). (32)

ASIS - Anterior superior iliac spine

evoked response (ER) - Abnormal and temporary contractions or behaviors (i.e. autonomic nervous system responses) generated by relatively wide range of motion maneuvers and due to the hypertonicity of the chains.

focal dystonia - Dystonic symptoms occurring at a local area.

Idiopathic Cervical Dystonia (ICD) - "A non-congenital, involuntary focal movement disorder characterized by variable contraction of cervical spine muscles producing rhythmic, semirhythmic, or static distortion of head posture on the cervical spine for which an apparent etiology was not established and which has been present for at least 3 months." (3)

involuntary (contraction) - An accessory contraction which may accompany an AIT. The patient is often unaware of its existence, and may be able to voluntarily relax it when made aware.

maneuver - An active or passive movement in the largest possible range of movement.(32)

morphology - The shape or alignment of a body

muscular chains - A chain is a set of polyarticular muscles that follow each other and overlap in the same direction, like tiles on a roof, with no break in continuity forming a single system. (2)(30)

paragon - The ideal posture shown by the outline of the body having straight and oblique lines and having symmetry between right and left sides.

postural dysmorphism - Deformations: pre-existing and/or induced distortions of the body.

Postural Reconstruction Physiotherapy - Postural Reconstruction is a neuromuscular physiotherapy technique that seeks to normalize excessive tone in certain groups of muscles and improve morphological alignment while reducing pain and dysfunction. (2)

therapeutic posture - One or a group of maintained maneuvers which include at least one maneuver that causes an aggravation of a deformation. The postures are developed and used to correct targeted dysmorphisms.

thoraco-brachial space - The space occurring between the arm and the lateral border of the thorax.

tone - The term ‘tone’ is the physiological level of non - myometabolic activity in muscles and chains of muscles. Hypertonicity is an elevation of this tone. (2)

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13. APPENDICES

13.1 Appendix I – Photographs

August 13, 1997 (second treatment)

October 22,1997 (twelfth treatment)

February 1, 2000 (thirtieth treatment)

Observations and comparisons of photographs

August 13th, 1997

anterior view

_ marked head rotation to the left
_ elevated left shoulder
_ left anterior chest more prominent than the right
_ left upper quadrant anterior of the right
_ left hand clenched
_ right oblique muscle pinching
_ left ASIS anterior of the right
_ forward head posture with a shortened flexed neck
_ right arm posterior of thorax
_ right leg posterior of left
_ mild head rotation and side flexion to the left
_ left shoulder elevated
_ left anterior chest is only slightly more prominent than the right
_ left upper quadrant less anterior than the right
_ left hand no longer clenched
_ no longer presents with forward head posture, neck is much longer as it is less flexed

right side view

_ internal rotation of femurs with complete thigh contact
_ left foot pronated, right foot supinated

left side view

February 1st, 2000

anterior view

_ no right oblique muscle pinching
_ left ASIS is not anterior of the right
_ space between the thighs
_ reduced right foot supination

left side view

_ legs equal from the side
_ right arm posterior of thorax

_ anterior line upper part slightly more vertical than ideal. From the xiphoid process to the pubic bone the anterior line slopes posteriorly with a broken prominence at the inferior ribs

_ right shoulder adducted and depressed

_ right scapula markedly lower than right, with the inferior angle winged

_ right scapula anteriorly tilted, left scapula posteriorly tilted

_ right waist crease higher than the left

<u>posterior view</u>

<u>right side view</u>

_ anterior line upper part is slightly more vertical than ideal. From the xiphoid process to the pubic bone the anterior line slopes posteriorly with a broken prominence lower in the abdomen

_ right shoulder no longer adducted and depressed

_ right scapula mildly interior to the left with mild winging of the inferior angle

_ scapula tilting approximately equal

_ right waist crease only slightly deeper and higher than the right

_ <u>posterior view</u>