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Conservative Treatment and Management of a Patient with Thoracic Spine Pain and Radiating Symptoms: A Case Report

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Conservative Treatment and Management of a Patient with Thoracic Spine Pain and Radiating Symptoms: A Case Report

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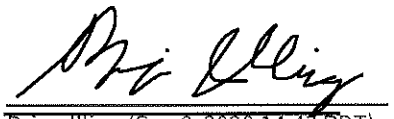
Signature 
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ABSTRACT

Background and Purpose: Back pain can occur for several reasons. With the increasing prevalence of smart-device use today coupled with sedentary lifestyles, there is an increasing incidence of back pain related to postural deficits associated with device use and extended periods of sitting or inactivity. The purpose of this case study is to investigate the effects of posture and ergonomics and their role in back pain for an office worker.

Case Description: This case study follows the treatment of a 45-year old male over his 4-week episode of care. The chief complaint of the patient was an acute exacerbation of back pain which began with an insidious onset.

Intervention: Therapeutic exercises, therapeutic activities, manual therapy and patient education were utilized throughout the course of treatment.

Outcomes: The patient reported significant relief and improvement in his symptoms (90%). Further significant clinical improvements were assessed via Shoulder Pain and Disability Index (SPADI) and the Patient-Specific Functional Scales (PSFS).

Discussion: The limitations of this case study and its applicability to the general back pain cohort are discussed. Additionally, the benefits of minimal, conservative treatment used for the highly motivated patient in order to reduce the cost and burden of care placed on the patient are discussed.

CHAPTER I

BACKGROUND AND PURPOSE

With the rising popularity of media devices such as smart phones, tablets and computers, there are rising concerns with user's posture-frequent users often exhibit incorrect posture, and the sequelae. One of these incorrect positions is the forward-head posture (FHP).

FHP is an epidemic that has become more prevalent in modern times. It is described as carrying the head forward of the center of the shoulder. As the head moves forward, the center of gravity shifts. To compensate for this shift in the center of gravity, upper body drifts backward and shoulders slump forward that the head is placed anterior to the trunk.[1] The result of FHP are greater stresses placed across the posterior thoracic region. The stabilizing musculature of the cervical spine, cranium and scapulae located on the posterior thorax must lengthen in order to compensate for FHP, and the ideal length-tension relationship of these structures may become compromised if prolonged.

Acute, short-term poor posturing poses less of an insult to the tissues involved. Postural deficits may become chronic, dysfunctional, and symptomatic if they are sustained for long durations on a regular basis. For example, while performing computer work in an office or commonly while using a smart device.[1] Eventually FHP may become the new setpoint or "posture of preference" for an individual, which corresponds with the approximate time the sequalae present. This is the result of prolonged, persisting poor

posture habits which become reinforced over time. The extent that the dysfunctional postural changes are correctable or permanent depends on the structural alignment of the spine, which may undergo adaptive changes overtime in response to the prolonged and persisting mechanical forces. See Figure 1 for an ideal posture compared with a symptomatic FHP and some of the involved musculature. FHP frequently appears in patients with neck disorders or disorders to the CT junction. Approximately 60% of cervicalgia patients are reported to have FHP.[2] It is estimated that 14 to 71% of the general population experience an episode of cervical pain at some point during their lifetime and pain recurrence is common. The annual prevalence of cervical pain has been reported to be 30 to 50%.[3]

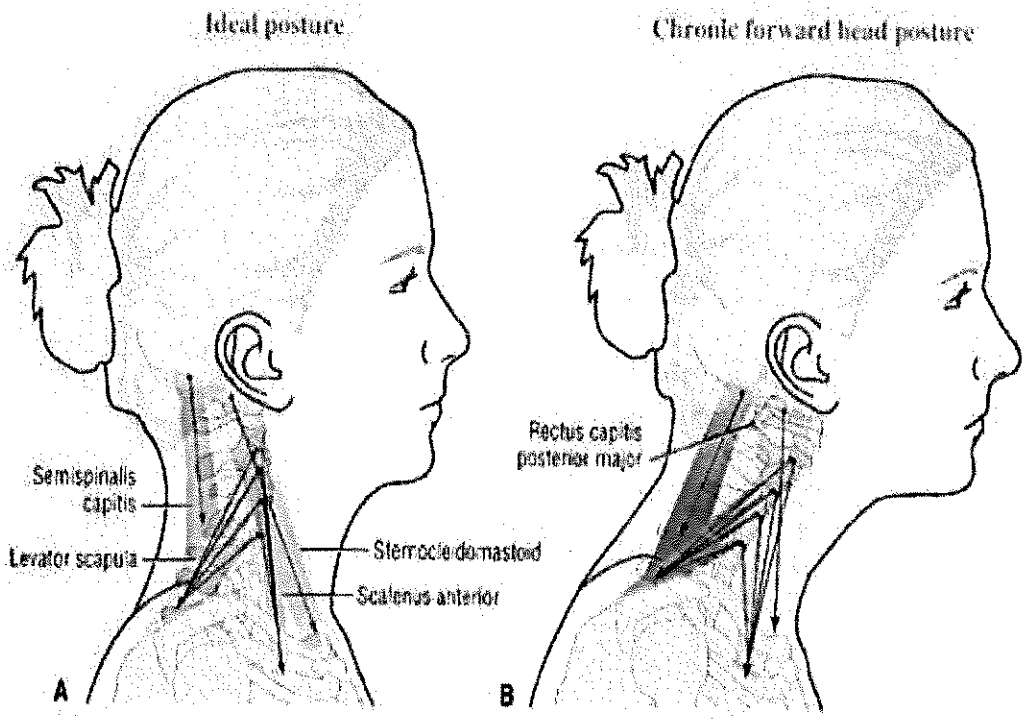

Figure 1. Ideal and Chronic Forward Head Posture(s).

FHP may be the result of either functional or structural changes. Functional changes imply the postural fault is flexible or may be corrected, while structural changes occur when the bony alignment has changed such that the posturing is more rigid, fixed and nonflexible.[5] For example, structural and functional (nonstructural) scoliosis. Functional scoliosis may resolve when the person lies supine or bends to one side. While on the other hand, structural scoliosis does not go away when the spine is bent to one side or the laying supine.[6] Postural deficits may or may not be painful, and the pain may be localized or referred to adjacent or distal segments.

The source of pain for an individual may not be the cause of the pain. For example, when postural deficits are allowed to persist unchecked and the involved tissues reach their compensatory limit, then pain results. The faulty mechanics may result in an abnormal length-tension relationship within the supporting soft tissue structures. This abnormal relationship may result in lengthened and weakened, and or shortened and stiff tissues, as well as localized pain, radiating pain or referred pain. Referred pain is a segmental component of nociceptive pain perceived at a location remote from the original injury site that shares a common segment or 2nd order neuron.[7] For example, an individual presenting with a lesion to proximal biceps tendon may report painful symptoms distally at their elbow or forearm.[8] Radiating pain is when the pain is more localized to the adjacent tissues or structures around the cause of the pain. For example- discussed in this case study, a patient presenting to therapy with moderate mid-thoracic hypomobility, FHP, and thoracic spine pain with pain radiating to adjacent ribs.

Postural screening may be a beneficial component of any thorough patient examination and evaluation. Screening coupled with collecting a thorough patient history,

and observation of patient's postural presentation, may warrant the clinician's decision to ascertain a postural screening or formal assessment. Postural deficits should be considered a symptom of faulty mechanics rather than the cause for a primary diagnosis. According to Sahrmann, [9] it is important to perform a thorough physical examination to identify mechanical faults and susceptible movement patterns which contribute to postural deficits and their sequelae. Additionally, conducting peripheral joint screening and clearance tests during examination is paramount for establishing differential diagnoses. For example, for a patient presenting with cervicalgia, it would be appropriate to screen the temporomandibular joint, glenohumeral joint, scapulothoracic joint, and thoracic spine to rule out other pathologies in addition to assessing the cervical spine when making a differential diagnosis.[10]

A subjective history should be collected prior to conducting the physical examination in order to guide the direction and focus of the exam. The following information ought to be gathered from the patient including: duration of symptoms and time of occurrence, quality and intensity of pain, relieving factors, notable changes in sensation, balance, or bowel/bladder, mechanism of injury (if applicable), prior and current levels of function, exercise and activity history and hobbies, and the primary goals of the patient for therapy. Special consideration should be given to questions pertaining to night-pain, weight loss, drug therapy, neurological symptoms, x-rays or medical imaging, and overall general health.[11] These questions of special consideration are a relevant piece of the clinical decision-making process when making a differential diagnosis and identifying possible red-flag signs.

Strengthening exercises have the best evidence of efficacy among the exercise regimens, whether for acute, subacute or chronic cervical and thoracic pain patients. This contrasts with low back pain where aerobic exercise has the greatest evidence of efficacy. Exercises for the cervical region should involve the posterior cervical muscles such as semispinalis cervicis and semispinalis capitis and the anterior flexor muscles namely longus cervicis and longus capitis, such as when performing a chin-tuck exercise.[12] Other exercises provided to the patient should target the scapular stabilizers, such as the rhomboids, trapezius, levator scapula, and serratus anterior to improve FHP and patient quality of life (QOL).[13] For example, rowing exercises using weight or bands for resistance and shoulder-blade squeezes.

There is evidence of efficacy for manipulation/mobilization in combination with exercise for treatment of non-specific neck pain for short-term pain relief and increased ROM compared to manipulation and/or mobilization alone or in combination but excluding exercise.[2,14] Improving the joint mobility and arthrokinematics coupled with strengthening the involved area has better results than just mobilizing or strengthening alone. According to JOSPT clinical practice guidelines, clinicians may provide thoracic manipulation a program of neck ROM exercises, and scapulothoracic and upper extremity strengthening.[15]

Patients should be encouraged to accept responsibility for managing their recovery rather than expecting the provider to provide an easy "cure." This process will promote using activity rather than pain as a guide, and it will make the treatment goal of return to occupational and non-occupational activities more obvious.[16] Non-specific stretching to the cervical region is not recommended as it is not helpful for treatment of

cervical and thoracic pain and may exacerbate symptoms. However, directional exercises and slump-stretching exercises may be helpful depending on the patient presentation. Strengthening exercises, including above mentioned cervical stabilization and scapular stabilizations exercises, are recommended but not until the acute period of cervical and thoracic pain has subsided.

Patients should be encouraged to return to usual activities and work as soon as possible because the evidence suggests that this return to activity results in the best outcomes for all spine disorders. Pain and function improved more rapidly in patients with an immediate or early (1-7 day) return to work.[17] This process may be undertaken using temporarily modified or alternate work duty for acute and subacute pain, particularly if the job demands exceed patient symptom tolerance. Full-duty work is a reasonable option for patients with acute and subacute pain syndromes with low physical job demands and the ability to control such demands, as well as for those with less severe presentations. Full-duty work is appropriate for those with chronic neck and thoracic pain syndromes, who do not have objective evidence that work would cause a significant risk of substantial harm that is imminent (American's with Disabilities Act), with the patient deciding whether the rewards of work despite symptoms are worth the "cost" of the symptoms.[18]

The focus of this case study will be on the reduction of thoracic spine pain and its radiating symptoms through the improvement of postural habits in conjunction with corrective exercises for scapular and cervical strengthening and positioning. The purpose of this study is to discuss and review the role of physical therapy in the general outpatient setting as it pertains to thoracic spine pain resulting from postural deficits, FHP. This will

show that physical therapy can have a positive impact and outcome by providing patient education in conjunction with ergonomic modifications and an appropriate HEP to address the biomechanical faults of the patient. Ideally, this will help assist with developing a future plan of care (POC) for patients with similar presentation, related postural deficits or unspecified cervical or thoracic spine pain with FHP.

CHAPTER II

CASE DESCRIPTION

This case study will focus on a 4-week episode of care of a 45-year old patient who suffered from thoracic spine pain at the levels of T3 to T7, which radiated to the adjacent ribs, R>L. Beginning with the subjective history of the patient, he was a right-handed, Caucasian male, 5'10 weighing approximately 240 pounds. His chief complaints were the unrelenting pain in his upper mid-back region, and that it would become aggravated while commuting to work, working at his desk on his computer, exercising, and while trying to fall asleep at night. He reported an acute onset of his symptoms, stating that upon waking one morning it felt like, "being stabbed with a knife." Throughout his 20's and early 30's he was regularly active: lifting weights 3-4 times per week with regularly cardio-aerobics such as walking, jogging or running 3x per week. He had recently resumed lifting weights after a long hiatus. For his occupation he worked in public health which involved a 45-minute commute twice weekly, and extensive amounts of computer work seated at his desk. His preferred hobbies and activities included attending or volunteering at church, playing games with his spouse and daughter, and going on family bike rides. The patient lives in an apartment with his wife and daughter on the first floor.

The patient reported that because of the pain in his back he was unable to get a restful night of sleep due to being unable find a sleeping position without aggravating his

back. He continued to work full-time, however said he was "on the brink of using sick leave," because the pain would increase throughout the work day from 2/10 in the morning to 7/10 by the end of the work day. The patient had also opted to put delay his return to weight lifting and he said that he could not even tolerate riding bicycle with his daughter.

Lasting back pain was a new condition for this patient. He reported experience a minor "tweak" on occasion in his late 20's, such as from sleeping wrong or moving nd lifting wrong, but he reports that it would resolve without intervention in a day or two. The patient tried to wait this incident out as well, but after a week without relief and poor sleep he sought out his chiropractor for an adjustment. He reported receiving chiropractic care a couple of times a year "to keep things moving." However, his chiropractor thought he had subluxated a rib at this time and that she was unable to successfully adjust or relocate the rib. He had not been provided with any corrective exercises, activities or stretches at this time, which will later be addressed in the discussion.

In addition to trialing chiropractic intervention, he sought out relief through massage therapy, which he said "felt great," but provided only temporary relief. After approximately 2 weeks of lasting discomfort and pain, he met with his primary care provider who gave him a referral for physical therapy in conjunction with a prescription for a muscle relaxant. He reported self-administering the medication only twice because he, "did not like how it made him feel, but it did help him to sleep." This was his first experience working with physical therapists.

Other than the patient's recent episode of back pain his past medical history is relatively minimal and unremarkable. Patient had existing comorbidities of hypertension

controlled through lifestyle and exercise-his vitals were not assessed at this time, elevated and obese BMI (34.4) according to US Department of Health & Human Services,[19] and he had had no major or minor surgeries. He reported taking a Centrum Silver multi-vitamin daily and that he had recently switched over to a plant-based diet, otherwise he takes no medications or OTC supplements. And he reported being a non-smoker and he seldom consumed alcohol with 1 or fewer drinks/week.

Examination, Evaluation and Diagnosis

After collecting the subjective history as detailed in the case description above, a thorough physical examination evaluation was performed based on Magee's Orthopedic evaluation of the spine and of the shoulder and Dutton's Guide for Managing Common Conditions.[20,21] The following exams were performed and assessed: active range of motion (ROM), passive ROM, resisted isometrics, peripheral joint screens, myotomes, functional assessments, special tests, reflexes, dermatomes, joint play, and palpation.

Upon observation-which began when greeting the patient in the clinic's waiting room, the patient had forward-flexed head position and rounded shoulders in seated and standing positions. The patient's right shoulder was more depressed than left, consistent with patient's dominant hand. During palpation tenderness was noted to upper trapezius bilaterally over supraspinous fossa and inferior to scapular spine bilaterally. Thoracic paraspinals were tender with deep palpation R>L tenderness. Cervical and lumbar paraspinals tender to touch. During joint play, there was noted hypomobility throughout mid-thoracic region from levels T3-T7. Active shoulder range of motion was within normal limits and symmetrical with slight pain at his end-ranges with overpressure. Cervical, thoracic and lumbar spine active range of motion were all within normal limits

and painful at all end-ranges without overpressure applied, except for extension. Spinal passive range of motion was also within normal limits and painful at end-ranges. Cervical, thoracic and lumbar resisted isometrics were all strong and painful. Manual muscle testing was performed on shoulder and scapular muscles. (see Tables 1 and 2 below for results.)

Table 1: Shoulder Manual Muscle Testing Results. *Indicates being painful.

Shoulder action	**Right**	**Left**
Flexion	+4/5 *	+4/5 *
Abduction	4/5 *	4/5 *
Extension	5/5	5/5
Internal Rotation	5/5	5/5
External Rotation	+3/5 *	+3/5 *

Table 2: Scapular Manual Muscle Testing Results. *Indicates being painful.

Scapular muscle	**Right**	**Left**
Upper Trapezius	5/5	5/5
Middle Trapezius	3/5 *	3/5 *
Lower Trapezius	3/5 *	3/5 *
Rhomboids	4/5 *	4/5 *
Latissimus Dorsi	5/5	5/5

Special tests were performed to rule out other possible pathologies and for differential diagnosis. These special tests included: Spurling and reverse-Spurling to assess for cervical muscle strain and/or cervical myelopathy; Cervical distraction to assess for nerve root compression or possible ligamentous lesion; Thump test to screen for possible fracture to vertebral structure; Hawkins Kennedy and Cross-Arm test to screen for shoulder impingement; Drop Arm to screen for possible rotator cuff pathology. All special tests were negative as they either produced no symptoms or structures involved in testing were intact. The exception being Cross-Arm impingement test, which was negative for impingement, but patient reported tightness to posterior shoulder

indicating possible involvement of posterior capsule of shoulder. (See Table 3 below for special tests, and respective findings and indications.)

Table 3: Special Tests: Findings and Indications.

Special Test	**Findings**	**Indications**
Cervical Region:		
Spurling's	Negative, bilateral	Nerve root involvement, cervical myelopathy
Reverse Spurling's	Negative, bilateral	Cervical muscle strain
Cervical Distraction	Negative	Nerve root compression, ligamentous involvement
Thoracic Region:		
Thump test	Negative	Possible vertebral fracture
Shoulder Region:		
Drop-Arm	Negative, bilateral	Rotator cuff involvement
Hawkin's Kennedy	Negative, bilateral	Shoulder impingement
Cross-arm	Negative L, Positive for posterior shoulder discomfort to R	Impingement with anterior discomfort, posterior capsule involvement with posterior shoulder discomfort

Additionally, the patient presented with rounded-shoulder posturing and bilaterally abducted scapula greater than 3-inches from the spinous processes with the R>L. Formal measurements were not assessed, rather the deviations were noted. In future practice, one should document scapular resting position to use as an objective measure for improving scapular positioning. It is normal for the scapula on one's dominant side to be more depressed and positioned lateral from the vertebral column, however the distance from the medial border of the scapula to the 4th thoracic spinous process in normal individuals has been found to be 6.00 cm ± 1.62 cm.[22]

The patient completed a patient-specific functional scale identifying his most impacted activities and limitations. (See Table 4 below.) Functional outcomes will be discussed further on.

Table 4: Patient Specific Functional Scale: Initial.

(Scale: 0=unable; 10=no difficulty)	Initial Visit	Final Visit
Sleeping	4	
Exercise	3	
Driving	5	

Prognosis and Plan of Care

Based on the findings of the physical examination and the subjective history of the patient, in the clinical decision-making of the writer, the patient had thoracic spine pain which radiated to adjacent ribs secondary to thoracic spine hypomobility and weakness of his scapular stabilizers, which resulted in postural deficits. The evaluation was low complexity due to the stable presentation of the patient, only 1-2 body structures were addressed in the examination, and the patient had no personal factors or comorbidities that impacted the plan of care.[23] With the information gathered through examination and collection of a subjective history, the International Classification of Functioning, Disability and Health (ICF) model was be used to identify relationships between the impairments of the patient, his activity limitations, and subsequent participation restrictions. (See Figure 2 and Table 5 below.)

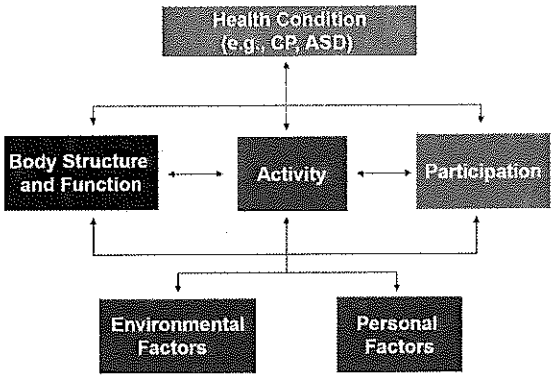

Figure 2. International Classification of Functioning (ICF) Model. Relates to body structure impairments and activity limitations regarding restrictions and limitations imposed on the patient. Focuses on the biopsychosocial aspects of the individual.[24]

Table 5. Patient ICF Model

Health Condition	Impairment	Activity Limitation	Participation Restriction
Thoracic spine pain	Positional pain	Side-lying and supine lying positions. Forward-bending to pick up an object.	Unable to get full night's rest. Unable to do recreational activities (biking and lifting weights)
Thoracic spine hypomobility	Forward-head, Rounded shoulders	Cannot tolerate sitting for extended durations	Commute to off-site work location Computer work seated at desk.

The most prominent problem the patient was facing was the pain, which produced the inability for him sleep restfully, and caused him discomfort while driving to work in addition to the increasing levels of discomfort experienced while working at his desk. Secondary problems were his painful end-range shoulder, cervical spine and thoracic spine ROM's, and thoracic hypomobility and weakness of his scapular stabilizers. (see Table 6 under Interventions).

Given the low complexity, moderate irritability of the condition, presentation of the patient, his minimal past medical history, supportive family and social network and his expressed motivation for positive improvement, it was expected that the patient would have a good outcome with conservative treatment. He was scheduled to be seen every other week, and was seen a total of 3 times throughout the 4-week episode of care with instructions to call-in and reschedule an earlier appointment should his symptoms worsen.

Short-term goals for this patient included reduction and improvement of his pain, education on office ergonomics and posture, and education on independent performance of a home exercise program (HEP) for self-management such that he will be able to

continue working without increasing symptoms and return to getting a full night's sleep. Long-term goals addressed his full-return to previous activities including biking and lifting weights combined with education on proper lifting technique in order to mitigate risk for repeat injuries.

CHAPTER III

INTERVENTION

The interventions selected for the patient consisted of combinations of manual therapy, therapeutic exercises, and educational interventions. Research has shown that with treatment of cervical or thoracic related spine pain, the combination of mobilization or manipulation techniques with therapeutic exercises has a greater efficacy and improved outcomes when compared to either as standalone intervention.[14,15]

The patient was seen every other week in Physical Therapy due to the high compliance of the patient and low complexity of his condition, for a total of three treatment sessions in this episode of care. Each therapy session lasted 30-40 minutes.

The therapeutic exercises utilized target the supporting and stabilizing structures of the scapula, because research has shown that strengthening and improving the neuromuscular efficiency-control and recruitment, of the scapular stabilizers can have a positive impact on shoulder, neck and head posturing.[2,13,25] These exercises included shoulder-blade squeezes, long-lever shoulder extension with scapular retraction using Theratube, supine lying shoulder horizontal abduction using Theraband, and the traditional chin-tuck exercise for upper cervical flexion and lower cervical extension.

Grade-5 manipulations were performed to thoracic spines from levels T3-T7 where the hypomobility was noted during initial assessment. The patient reported a positive response along with presence of cavitation during manipulation technique upon

delivery of high-velocity low amplitude (HVLA) thrust. Thoracic manipulations (Grade-5) were performed only at the start of treatment, after patient had warmed up on an ergometer or upright stationary bike for approximately ten minutes.

The patient was provided an HEP with instructions to perform the exercises listed twice daily, minimum. The patient received verbal instruction on performance of exercises coupled with visual demonstration. He then performed the exercise himself while receiving manual, tactile cuing along with verbal corrective instructions. The HEP of the patient was progressed each therapy session as his symptoms improved and his ability to engage in activities without pain or exacerbation increased. (See Table 6.)

Table 6. Initial Home Exercise Program.

Exercise	**Repetitions**	**Sets**	**Times Per Day**	**Resistance**
Chin-tucks	15	2	2-3	None
Shoulder squeezes	15	2	2-3	None
Long-arm shoulder extension	15	2	2-3	Red Theratube
Supine-lying shoulder horizontal Abduction	15	2	2-3	Green Theratube

The chin-tuck exercise was performed in a seated position with instruction to "sit-up straight and tall, as though you are being pulled taller by a string attached to your head." Then cervical retraction was performed as a combination of upper cervical flexion and lower cervical extension such that the head moves backwards parallel with the transverse plane as if "your head is on a rail-cart going purely backwards" and held for an isometric contraction of 2-3 seconds. Shoulder blade squeezes were performed in a seated or standing position, the scapulae are retracted by engaging the middle trapezius, rhomboids and levator scapulae with cues to "avoid an elevated your shoulders upward while performing." Again, each repetition was held isometrically for 2-3 seconds before

releasing. Long-lever shoulder extension with scapular retraction was performed using a red Theratube secured in a doorway for resistance. The movement was initiated by retracting scapulae-similar to the shoulder-blade squeeze exercise, then with extended elbows and neutral forearms the shoulders are extended from shoulder height to alongside the body in the sagittal plane. The patient was instructed to "bring your arms down to your sides keeping your elbows straight and shoulder blades squeezed." This was an isotonic exercise with both concentric and eccentric phases, while the amortization phase was a controlled, 1-second isometric-hold between transitions. Horizontal shoulder abduction exercise was performed in supine with a towel roll placed vertically along the length of the spine to assist with positioning, and using green Theratube used as resistance. Elbows remained extended and hands were in neutral position grasping the Theraband, then while maintaining extended-elbows, the shoulders were horizontally abducted until the dorsal aspects of each hand contacted the mat. This was another isotonic exercise with both eccentric and concentric phases and a 1-second isometric hold amortization phase.

In conjunction with the HEP, the patient was provided with a postural-educational intervention in the form of an office ergonomic brochure. Extended durations seated, such as while performing desk work and driving long distances contribute to facilitating and potentiating postural deficits.[1,18] Simple modifications may make a significant difference in improving office ergonomics, such as: raising the height of a computer monitor to be level with the brow or forehead; positioning the monitor at least twice its height's distance away from the person; properly fitting the chair for one's height and leg length to allow the knees to rest bent 90-degrees with feet flat on floor; and a lumbar

back support; also having the keyboard or desk at an appropriate height to allow arms to rest comfortably on surface without shoulder elevation or significant abduction; and lastly, a form or wrist support.[4] (See Figure 3.)

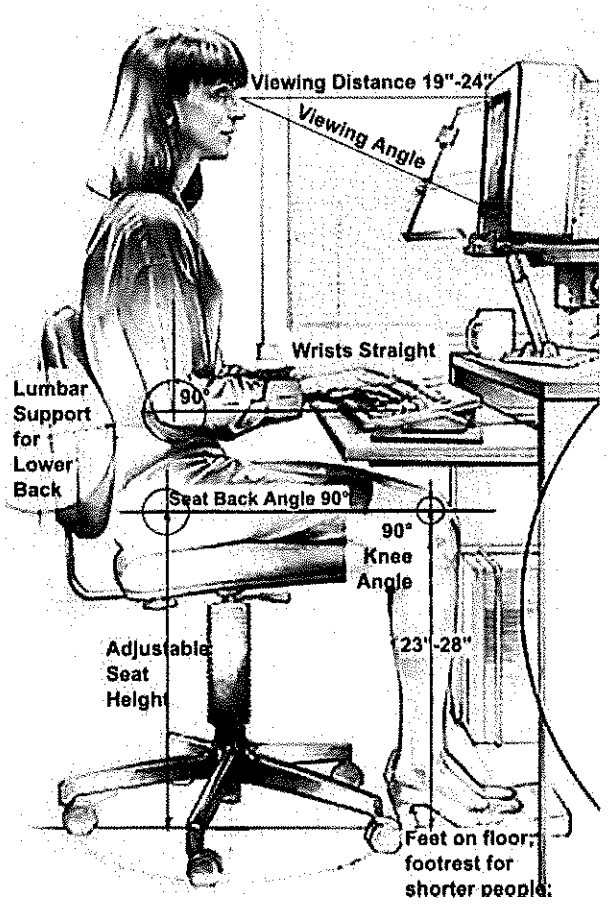

Figure 3. Office Ergonomic Brochure.[4]

As the patient improved and he became less sensitive and irritable with resisted isometrics, his HEP was progressed through three phases. These are the phases according to Sahrmann for progressing and regressing individuals with movement or mobility dysfunctions: Stage 1, Symptom Management (Protect); Stage 2, Movement Correction and Development (Correct); and Stage 3, Movement Optimization (Develop). (See Table 7.)[9] The phases of progress-regression are a fluid contiunuum and could be augmented

and adapted based on presentation of patient on any given session. The patient was seen for 3 visits and progressed 1 phase each treatment session until discharge.

Table 7. Stages of Treatment.[9]

Phase	Purpose	Keyword
1. Symptom Management	Manage and control acute symptoms such as pain inflammation, sensitivity and reactivity.	Protect
2. Correct and Develop Movements	Correct mechanical faults in existing movement patterns and develop appropriate movement patterns and strategies.	Correct
3. Movement Optimization	Full return to normal activities with progression of activities beyond prior level of function.	Develop

CHAPTER IV

OUTCOMES

The patient in this case had an exceptional outcome based on self-reporting combined with two functional outcome measures. The functional assessments used included the Shoulder Pain and Disability Index (SPADI) and Patient Specific Functional Scale (PSFS). In conjunction with repeated functional measures, at the start of each treatment session the patient was asked, "How do you feel things are going: the same, better or worse?" The patient was then asked to report his self-perceived improvement; 0% improvement meaning no change and 100% improvement meaning complete resolution of his chief complaints.

By the start of the second treatment session the patient self-reported that he was doing "much better" and approximated an 80% improvement in his overall condition and symptoms, he said that he was able to get a full night of rest consistently. Driving during his work commute no longer was causing discomfort. He had adjusted his work space as per recommendations and the office-ergonomic brochure, however he was still having minor discomfort by the end of his work day. Based on his improvement in conditions and reassessment of resisted isometrics and thoracic joint play, he was encouraged to resume normal weight lifting activities with additional education provided for safe lifting techniques.

By the third treatment session the patient reported 90% improvement in symptoms and, "he would have rated it higher, but there is *always* room to improve." He reported having resumed weight lifting activities following the provided recommendations regarding lifting technique. His sleeping continued to improve, as did his tolerance for seated computer work, which no longer caused discomfort or symptoms by the end of his work day. Functional measures were reassessed during this treatment session, both the SPADI and PSFS showed significant clinical improvements. Overall, the functional measures were indicating that the patient was appropriate for discharge.

The SPADI was used which consists of 13 items and measures two domains: both pain and disability based on the patient presentation. There are scores for pain-5 items out of 50 points and disability-8 items with scores out of 80 possible points for a combined total aggregate of 13-items and scores out of 130 points. Larger scores are indicative of higher degrees of pain and or disability. The minimal detectable change for the SPADI has been determined to be 13 points at 90% confidence.[26] The patient had a 25 total point reduction in SPADI scores or an approximate 20% improvement in shoulder pain and disability following treatment. The initial and final SPADI scores of the patient are listed in Table 8. (Appendix 1 for SPADI.)

Table 8. SPADI Scores

SPADI	Initial	Final
Pain	22/50	1/50
Disability	6/80	2/80
Total	28/130	3/130
Percentage	21.5%	2%

The PSFS was also used, which was determined to be a valid, reliable and responsive outcome tool for patients with upper extremity problems.[27] However, its use is

exclusively unique to the individual, and it is not appropriate for use at or as group-level data.[27] The patient is asked to self-identify activities that their condition is causing them to have issues performing, or participating in, and then rate the identified items on a 0-10 scale; 0 indicating that they are unable to perform or participate and 10 indicating that they are 100% able to perform and participate in the specific activity. (Appendix 2 for PSFS.) The minimally detectable change was determined to be 1.2 points, however in the clinic setting of this case, minimal detectable change of 2 points was used. The patient specified sleeping, driving and exercising as the activities his condition was limiting his participation in. The results of his initial and final PSFS are in Table 9.

Table 9: Final Patient Specific Functional Scale: Final.

(Scale: 0=unable; 10=no difficulty)	Initial Visit	Final Visit
Sleeping	4	10
Exercise	3	9
Driving	5	10

During the 3rd treatment session manual muscle testing was repeated to reassess the specific muscle groups which had been identified as fair or good, but caused irritation with the resisted movement. Overall, the strength of these muscles improved throughout the episode of care and the patient reported no discomfort, irritation, or pain with the application of resistive overpressure. (See Table 10.)

Overall, the patient reported no adverse effects to treatment or with any specific interventions or ergonomic modification. His compliance was remarkable. He had several intrinsic and extrinsic motivational factors: he was determined to make improvements, this was coupled with his supportive family network. The patient reported that he was

pleased with the course of treatment, and satisfied with his results. Having been his first experience in physical therapy he reported it being very positive.

Table 10: Repeated Manual Muscle Testing.

	Right	Left
Shoulder Flexion	5/5	5/5
Shoulder Abduction	5/5	5/5
Shoulder External Rotation	+4/5	+4/5
Lower Trapezius	4/5	4/5
Middle Trapezius	4/5	4/5

CHAPTER V

DISCUSSION

Throughout the 4-week episode of care, the patient had a very good outcome with minimal, conservative treatment consisting of patient education, manual therapy and therapeutic exercises. The largest factor independent of the applied treatment was the patient's motivation to improve his condition. The goals of the patient were directed towards resuming his normal routine and activities such as sleeping without waking from pain, reducing pain while working and being able to return to exercising regularly. simply put, the patient was determined to return to his prior level of functioning and beyond.

Education was a large component of treatment and achieving the established goals, including returning to work, which involved extensive computer work while seated at a desk. According to Nejati,[1] factors such as prolonged sitting or improper posture of head during work may have a great role in neck pain occurrence among office employees, particularly among those who work with computers. An office-ergonomic intervention in the form of education proved to be appropriate and beneficial for the case patient as he applied the education received and modified his workplace to better accommodate proper posture. Also, proper lifting technique and biomechanics were another mode of education incorporated into treatment. The patient readily achieved his goals of being able to sleep a full night without waking from pain and to have reduced

pain and discomfort while commuting or doing computer work. Subsequent to meeting the prerequisite goals he made a modified return-to-exercise utilizing the provided education on lifting technique and biomechanics. It is noteworthy that the patient did not require taking a work leave of absence due to his condition, and rather than reducing activity the patient set goals as ways to increase his activity. According to Shaw et al,[17] pain and function improved more rapidly for workers with an immediate (30.7%) or early (1 to 7 days) return to work (RTW) (36.8%). The patient wanted to avoid being unable to work, therefore his continued working combined with his motivations likely accelerated his recovery and good outcome.

The approach to treatment in this case was one of patient-centered care. The patient assumed an active participatory role guiding the direction of treatment. For example, the patient demonstrated improvements in his symptoms with successful progressions to his HEP each treatment session. Exercises were advanced or substituted with higher skilled movements to further challenge and promote positive change as it related to the musculoskeletal system. The patient had asked for exercises and received education and demonstrations on performance of several exercises which could function as replacement for progressions to the basic scapular-squeeze. The exercises provided depended on the equipment the patient had accessible to him, which was plenty as he lived one city block from his wellness facility. Through education and allowing the patient to take an active role in choosing exercises from a selection, his overall adherence and compliance improved independent of his motivation. According to Zolkefi,[28] giving patients choices has been linked to their increased satisfaction with care received. It has also been suggested that patient preferences are essential to good clinical care because the

patient's cooperation and satisfaction reflect the degree to which intervention fulfils his or her choices, values and needs. Cooperation in decision-making results in greater trust in the health professional-patient relationship.[29]

Manual therapy techniques were used to mobilize the thoracic spine as a means to restore mobility and reduce symptoms. While both exercise and manual therapy have shown to produce good outcomes spine-related pain, the combination of the two interventions have shown to be superior to either as a standalone intervention.[14,15] In this episode of care mobilizations were provided during the initial session with subsequent re-assessment of the thoracic spine in following treatments. A cavitation was produced with delivery of the HVLA which prompted a positive response from the patient. According to Van Geyt et al,[30] the patient's subjective experience related a manipulation is influenced by cavitation occurrence, which could help to increase confidence and improve the patient-therapist relationship.

Reflective Practice

There were some limitations to this case study which could improve the utility of the data collected as it applies to assessing and treating back pain and postural deficits. For instance, the patient was seen every other week, with this frequency it is more difficult to gauge the patient's rate of improvement in response to treatment as opposed to a weekly treatment schedule. With a weekly treatment plan it would prove easier to determine when and what made the most significant impact on the patient outcome. However, with a higher frequency of treatment there would also be a higher burden on the patient via direct and indirect costs.

Another limitation was the absence of a quality of life (QOL) assessment tool. While the PSFS was used to identify activity limitations and participation restrictions, the overall quality of life of the patient was not formally assessed. Regardless, the patient reported satisfaction in his episode of care and subsequent outcome. However, had QOL been assessed throughout treatment, it may have proven to be another useful adjunct to the functional assessments used and provided insight into how treatment impacted the patient's QOL. The final limitation identified is that the course of treatment was specific to this individual patient, and therefore the applicability of this case may not be for the general population.

There are a couple areas in which, if this patient were treated again, would be done differently. For example, resting scapular position was observed during the initial examination but not formally measured, nor was the resting position reassessed at follow-up sessions. Measurements ought to have been made during the initial examination and again during follow-up sessions to better objectively measure the change in resting position in response to intervention. Abnormal scapular positions can alter the activation of the stabilizing muscles such as the levator scapulae and upper trapezius muscles.[2] Therefore, objective measurements of change in resting position of the scapulae would offer further support for the treatment approach used in this case.

In conclusion, the conservative, patient-centered approach to therapy was effective in facilitating the patient's return to his prior level of functioning, and even beyond. The patient reported satisfaction with the physical therapy care received and his outcomes. The outcomes were viewed as satisfactory in the eyes of the therapist as well.

Yet, further research is needed to identify the best combination and frequency of interventions to address thoracic spine pain with postural deficits.

APPENDIX

Appendix 1 - Shoulder Pain and Disability Index (SPADI) subjective form.

Shoulder Pain and Disability Index (SPADI)

Please place a mark on the line that best represents your experience during the last week attributable to your shoulder problem.

Pain scale

How severe is your pain?

Circle the number that best describes your pain where: 0 = no pain and 10 = the worst pain imaginable.

At its worst?	0	1	2	3	4	5	6	7	8	9	10
When lying on the involved side?	0	1	2	3	4	5	6	7	8	9	10
Reaching for something on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Touching the back of your neck?	0	1	2	3	4	5	6	7	8	9	10
Pushing with the involved arm?	0	1	2	3	4	5	6	7	8	9	10

Disability scale

How much difficulty do you have?

Circle the number that best describes your experience where: 0 = no difficulty and 10 = so difficult it requires help.

Washing your hair?	0	1	2	3	4	5	6	7	8	9	10
Washing your back?	0	1	2	3	4	5	6	7	8	9	10
Putting on an undershirt or jumper?	0	1	2	3	4	5	6	7	8	9	10
Putting on a shirt that buttons down the front?	0	1	2	3	4	5	6	7	8	9	10
Putting on your pants?	0	1	2	3	4	5	6	7	8	9	10
Placing an object on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Carrying a heavy object of 10 pounds (4.5 kilograms)	0	1	2	3	4	5	6	7	8	9	10
Removing something from your back pocket?	0	1	2	3	4	5	6	7	8	9	10

Appendix 2 - Patient Specific Functional Scale (PSFS) subjective form.

Patient-specific activity scoring scheme (Point to one number):

0 1 2 3 4 5 6 7 8 9 10

Unable to perform activity

Able to perform activity at the same level as before injury or problem

(Date and Score)

Activity	Initial					
1.						
2.						
3.						
4.						
5.						
Additional						
Additional						

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