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# Management of Whiplash-Associated Disorder Addressing Thoracic and Cervical Spine Impairments: A Case Report

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# Management of Whiplash-Associated Disorder Addressing Thoracic and Cervical Spine Impairments: A Case Report

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## Abstract

**Background:** Whiplash-Associated Disorders have a relatively high rate of chronicity with 30-50% of patients sustaining systematic whiplash injury reporting chronic symptoms. Physical therapy is often recommended as a treatment and this case report looks to contribute to the knowledge base for future evidence-based treatment of impairments in this population. **Description:** The patient was a 41-year-old male with complaint of cervical and thoracic stiffness and pain following a high speed (>45mph) motor vehicle accident (MVA). The patient was evaluated by a physician two weeks following accident and referred to therapy 4 weeks following MVA. **Methods and Measures:** An examination for physical impairments was performed, including the measurement of cervical range of motion using goniometry, and the assessment of soft tissue and segmental mobility of the upper thoracic and cervical spine regions. The FOTO (Focus on Therapeutic Outcomes) questionnaire was used at intake, 4 weeks and 8 weeks. **Intervention:** Manual therapy and therapeutic exercises were used to address the identified impairments. Manual therapy techniques included soft tissue mobilization, joint mobilization, and joint manipulation. The patient was seen for 8 visits scheduled over 8 weeks. **Outcomes:** The patient reported complete resolution of symptoms and demonstrated a 21-point increase in FOTO scores at 8 weeks. The patient also demonstrated significant improvements in cervical lateral flexion and rotation range of motion at the 8 weeks mark. **Discussion:** This case report highlights various interventions used to address cervical and thoracic spine impairment following a high-speed motor vehicle accident. The purpose of this case report is to describe the use of high-velocity low-amplitude thrust (HVLAT) manipulations to treat acute cervical impairments and therapeutic exercises and neuromuscular reeducation to address chronicity of symptoms. **Conclusion:** Addressing impairments of the cervical and thoracic spine with high-velocity low-amplitude thrust manipulations and therapeutic exercises in patients with whiplash-associated disorder is associated with reduced pain, decreased stiffness, improved functional outcome and increased cervical range of motion. More research and follow up is needed to look at the long-term efficacy of said treatment in the prevention of chronic whiplash symptoms.

**Keywords:** Whiplash; thoracic spine; cervical spine; orthopedics; physical therapy; rehabilitation; high-velocity low-amplitude thrust; manipulation; FOTO

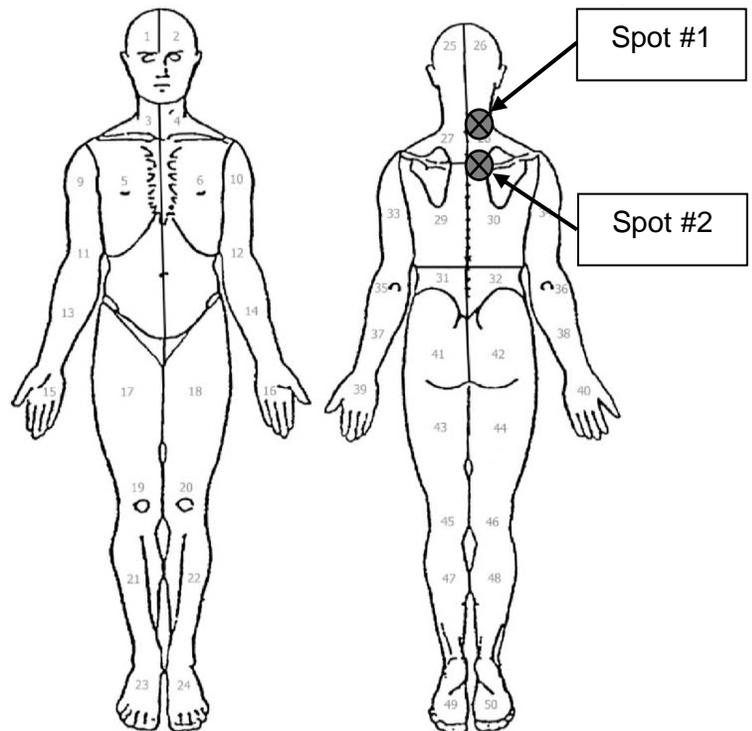
## Background

Whiplash is the most common motor vehicle injury in the United States. Whiplash-associated disorder (WAD) is the name given to the complex collection of symptoms affecting the neck that result from an acceleration-deceleration mechanism of injury included in motor vehicle accidents (MVA).<sup>14</sup> Between 30-50% of patient suffering from whiplash injuries will report some chronic symptoms.<sup>3,5</sup> Given such high rates of chronicity, treatments that promote a full early recovery are ever more necessary. In recent years there has been increased understanding of the mechanistic nature of whiplash associated disorders (WAD) but due to variability in presentation, interventions have provided mixed success in the prevention of chronic symptoms. Studies have demonstrated limited consensus on the treatment of acute whiplash disorder, but early movement and physical therapy intervention have been supported over rest and cervical collar.<sup>1</sup> This case report focuses on treatment of acute impairments following current clinical practice guidelines and other whiplash case reports to promote an early resolution of symptoms.<sup>1,9</sup> This case report describes the use of high-velocity low-amplitude thrust (HVLAT) manipulations to address acute range of motion stiffness impairment and therapeutic exercises to address return to normal function to prevent chronicity of symptoms. The purpose of this case report is to describe management of cervical and thoracic level impairments with manipulations and therapeutic exercises in a patient with an acute whiplash injury.

## Description

**History:** The Patient is a 41-year-old male with chief complaint of neck pain and soreness following a motor vehicle accident (MVA) at >45mph with no loss of consciousness.

The Patient was a software engineer that reported to therapy that reported to therapy 4 weeks following MVA. Patient was initially evaluated by physician two weeks following accident after complaints of muscle spasms, increased neck stiffness and soreness in the weeks following the accident. Patient also reports suffering from persistent tinnitus since the accident. Cervical radiographs were taken and were found to be negative for any fractures. The patient reports significant medical history of Scheuermann's disease leading to increased kyphotic posture. No history of fracture or other bone disease was reported by patient. Patient also reports previous history of MVA > 15 years prior, but no chronic symptoms reported. The Patient reported taking ibuprofen for occasional neck pain and Albuterol, Flovent and Rautidine for allergies and heartburn. The patient was physically active and enjoyed walking, hiking and rock climbing but had not participated in any activities since the accident. The patient reported a resting pain of 0/10 and occasional pain of 1/10 on the numeric pain rating scale (NPRS). The patient stated his pain at worst was a 6/10, with the pain located along the mid cervical and mid thoracic spine with extension into right upper trap and right thoracic spine as depicted in the body chart in Figure 1. The patient described his current pain as a stiffness/soreness that limited his cervical range of motion. Additionally, the patient reported the occasional cervical and thoracic muscle spasm that had been present since the accident. The patient reported that his symptoms were aggravated with prolonged sitting and relieved



**Figure 1:** Body chart depicting the patient's trigger point locations.

with walking and stretching. His primary goals for therapy were to reduce his current stiffness/soreness and prevent any chronic symptoms from developing.

**Examination and Evaluation** The patient presented to therapy with significant forward head rounded shoulders posture with severe thoracic kyphosis related to his Scheuermann's disease. The patient demonstrated slow active cervical movements limited by stiffness and pain. The patient's cervical spine was cleared of any neurological involvement and range of motion and special test results are displayed in table 1. Next, cervical passive range of motion (PROM) and segmental mobility was assessed in supine. The therapist noted any responses to end range cervical rotation in neutral as well as with flexion and extension. The patient responded to PROM with general pain and stiffness at end range with cervical rotation being most limited and eliciting a pain of 5-6/10.

**Table 1:** Summary of Initial Findings.

Test Category	Test	Finding
<b>Cervical Range of Motion</b>	Extension AROM	40 degrees
	Flexion AROM	70 degrees
	R. Lateral Flexion AROM	40 degrees
	L. Lateral Flexion AROM	30 degrees
	R. Rotation AROM	60 degrees
	L. Rotation AROM	60 degrees
<b>Shoulder Range of Motion</b>	Left	WFL and equal bilaterally
	Right	WFL and equal bilaterally
<b>Segmental Mobility</b>	Upper Cervical	Slight Hypomobility and guarding
	Mid Cervical	Normal
	Lower Cervical	Hypomobility
	Upper Thoracic	Hypomobility
	Mid Thoracic	Hypomobility
<b>Special Test</b>	Compression	Reproduces symptoms
	Distraction	Negative
	Spurling's Left side	Negative
	Spurling's Right side	Negative
	Sharp-Purser	Negative
<b>Grip Strength</b>	R-105lbs	L-110
<b>Cranial Nerves</b>	I-XII	Normal

**Diagnosis and Prognosis** Signs and symptoms consistent with whiplash associated disorder manifesting in cervical and thoracic pain and limited range of motion. Plan of care was established at 8 weeks, 2x per week with treatments involving manual stretching, soft tissue mobilizations, high velocity low amplitude manipulations (HVLAT), neuromuscular reeducation, and therapeutic exercises.

### Methods and Measures

The patient's active range of motion (AROM) and subjective report was taken at the start of each session. If range of motion deficits were seen grossly or the patient reported significant "stiffness", appropriate interventions were performed and AROM visually assessed afterwards. Formal AROM measurements were taken with goniometry after manipulations and manual treatments. Initial FOTO (Focus on therapeutic outcome) assessments were taken at evaluation, 4 weeks and again at discharge (8wks). Subjective reporting was also recorded by the therapist each session and percentage

of progress and reported by patient throughout sessions. According to 2010 statistics analyzing the usability, validity, sensitivity, and responsiveness for FOTO outcome surveys, intake functional status measures demonstrated average values of 52 (SD 17), discharge scores of 66 (SD 18), and functional status change scores of 14 (SD 18) which creates an effect size that is considered large (0.82).<sup>10</sup> This data suggests that FOTO functional status measures are sensitive and responsive to change and valid to use for this case.

### Intervention

After the initial evaluation, treatments were focused on addressing cervical ROM impairments. Initial treatments used to address cervical “stiffness” and achiness”, were gentle cervical vertebrae mobilizations with movement, and cervical and thoracic manipulations. Once ROM impairments were addressed, the patient was given therapeutic exercises focusing on retraining cervical and thoracic musculature as well as self-mobilization strategies used to address cervical and thoracic trigger points. Cervical and thoracic manipulation were used as needed in later session if patient reported cervical and thoracic stiffness and tenderness. A description and instruction of the manipulation techniques used are depicted in the video linked in table 3. The 8-week treatment schedule is also described in table 2 with 1 treatment being delivered in week 4 due to the patient having a work trip early in the week and no treatments during week 6 and 7 due patient taking a vacation overseas.

**Table 2:** Treatment Schedule.

Week	# of Visits
1	1x
2	2x
3	2x
4	0
5	2x
6	0
7	0
8	1x

**Table 3:** Manipulation Techniques used during interventions.

Manipulation	Technique Referenced
Cervical Thoracic Junction (CTJ)	Video Title: Prone Cervical Thoracic Junction Opening Manipulation
Prone Lateral Glide Manipulation	Video referenced: <a href="https://www.youtube.com/watch?v=0LS1k_hW2Bc">https://www.youtube.com/watch?v=0LS1k_hW2Bc</a>
Upper and Mid Thoracic Supine Manipulation	Video Title: Thoracic Manipulation  Video Referenced: <a href="https://www.youtube.com/watch?v=AC5Xzmhkqzo">https://www.youtube.com/watch?v=AC5Xzmhkqzo</a>

### Week 1-2:

#### Evaluation and Treatment Session 1

**Manual Therapy:** HVLTAT manipulations to thoracic spine

**Therapeutic Exercise:** Upper Trap and Levator Scapulae Stretches, Foam Rolling and lacrosse ball

**Home Exercise Program (HEP):** Upper Trap and Levator Stretches, Foam Rolling and lacrosse ball. Heat as necessary, Scapular retraction with shoulder depression

#### Treatment Session 2

**Manual Therapy:** Suboccipital release, Upper cervical lateral Oscillations, STM to bilateral upper traps and lateral cervical musculature.

**Therapeutic Exercise:** Deep neck flexor training with flexion and rotation.

**HEP:** Deep neck flexor training, Self-SNAG and cervical U

After the initial evaluation, treatments were targeted at addressing the patient’s pain, stiffness and range of motion impairments. Current clinical practice guidelines support the use of manipulations in conjunction with therapeutic exercise to reduce these impairments.<sup>1</sup> The goal of the initial two treatment sessions was to address the stiffness and range of motion impairments and manual techniques with manipulations. Previous research has highlighted the role of the thoracic spine in acute neck pain so that was the target of initial manipulations.<sup>6,9,11</sup> The patient was cleared of all

contraindications to manipulations and the patient's severe kyphosis was noted as a precaution. Consent was given by the patient for the upper and mid thoracic spine manipulation technique described in table 2 to be performed. The technique was performed by the therapist with limited success. Technique and positioning were slightly altered to address for kyphotic posture, but manipulations did not produce a notable cavitation in the upper or mid thoracic spine. Although a cavitation is not necessary for a manipulation to be successful the patient continued to report some stiffness and pain in the two trigger points identified in Figure 1.<sup>6</sup>

With the patient in supine, soft tissue mobilization was performed to sub-occipital region, right lateral cervical musculature, and right upper trap. Trigger points were noted during palpation and deep pressure was applied for 5-10 seconds 2-3x per trigger point identified in Figure 1. Also, while supine gentle lateral oscillations were provided to each cervical vertebra, taking noted of pain responses and mobility of each segment.

After completing manual therapy techniques, the patient was instructed on self-trigger point release techniques using a lacrosse ball and a 6" foam roller. The foam roller proved to access identified trigger point so patient focused on using lacrosse ball. The patient was given instructions to maintain low to moderate pressure on trigger point for 10 seconds and complete 2-3 repetitions or until trigger point was released. The patient was able to successfully release thoracic trigger point within therapy session.

To focus on maintaining range of motion improvements and prevent the return of trigger points and cervical stiffness the patient was given an upper trapezius and levator scapulae stretches to perform at home while also instructed on a self-sustained natural apophyseal glide technique described by Mulligan with a towel or bed sheet.<sup>12</sup> The patient was also instructed on performing a cervical U-pattern in sitting. This involved having the patient retract his shoulders blades and find and neutral upright posture with his cervical spine slightly retracted and head in a slight nod. From this position the patient was instructed to make a small U-shape with his nose and gradually increase the arc of the U while maintaining in a pain-free range. The patient was asked to perform 2 sets of 10 repetitions of each exercise twice per day while also performing manual release techniques as needed.

### Week 2: Treatment Session 3

**Manual Therapy:** sub occipital release, STM to right upper trap with active cervical rotation and Prone CTJ lateral glide HVLAT manipulation

**Therapeutic Exercise:** Deep Neck flexor training

**HEP:** Modified Self-Sustained Natural Apophyseal Glide (SNAG)

The patient reported that working through tender trigger points with lacrosse ball helped provide great relief, but the thoracic trigger point seemed to reappear after 2-3 hours at work. The patient presented to therapy with thoracic trigger point and cervical stiffness. To address these impairments the therapist performed an active release technique (ART) to the patients right upper trap. This technique involved a pin and stretch of the patient's right upper trap while asking the patient to rotate their head to the left. The patient noted slight range of motion improvement and decreased cervical stiffness with this technique but still had the trigger point in his

thoracic spine. To address the trigger point in his upper thoracic spine a prone cervical thoracic junction (CTJ) lateral glide manipulation was used. Again, caution was noted with patient positioning due to significant kyphosis. The manipulation was performed bilaterally, and cavitations were noted with each manipulation. The patient demonstrated significant range of motion improvement as shown in table 4 and completed resolution of his thoracic trigger point.

**Table 4:** Cervical range of motion following intervention, with change from initial evaluation.

Direction	ROM (deg)	Change
Extension AROM	58	+18
Flexion AROM	64	-6
R. Lateral Flexion AROM	45	+5
L. Lateral Flexion AROM	46	+16
R. Rotation AROM	86	+26
L. Rotation AROM	90	+30

Therapeutic exercises provided during this session were a series of deep neck flexor reeducation.<sup>13</sup> Due to research suggesting physiological changes to neck musculature following a whiplash injury, deep neck flexor reeducation was used to prevent fatty infiltrate from occurring.<sup>1,3</sup> To initiate this reeducation the patient was taught how to perform a head nod in supine. The patient was asked to complete 10 repetitions holding each repetition for 10 seconds. Due to the patient's severe kyphosis the patient had difficulty performing a head nod without increased abdominal activation. The patient was asked to palpate his abdomen and a towel roll was placed at the top of his occiput to provide neutral level starting position for his head and a fulcrum for which to head nod. The patient was also asked to focus on performing head nod without feeling an abdominal contraction through his hands. This proved to be a successful modification for his natural posture. After performing this exercise, the patient's self-SNAG technique were reviewed and modified to address both the middle and upper cervical spine with changes in the towel pull angle.

In addition to discussing his HEP, the therapist discussed a return to normal recreational activities for the patient. Current evidence suggests returning to normal activities as quickly as tolerable over rest.<sup>1,2,3,4,5</sup> The patient previously enjoyed rock climbing and hiking, so the patient was encouraged to return to these activities and monitor symptoms.

### Week 3: Treatment Session 4

**Manual Therapy:** Right middle trap and rhomboid release with active horizontal abduction, IASTM to middle trap, rhomboids, and upper trap.

**Therapeutic Exercise:** Quadruped Pull through, banded scapular retraction, push up +, wall slides

**HEP:** Quadruped reach and pull through, banded scapular retraction, push up +, Scapular wall slides with foam roller

### Treatment Session 5

**Manual Therapy:** Right middle trap ART, STM middle trap/ rhomboids.

**Therapeutic Exercise:** deep neck flexor reeducation, flexion with rotation

**HEP:** Address ergonomics in workplace, reduce workplace fatigue with breaks.

At visit 4, the patient reported consistently having to release tender spots in thoracic spine with lacrosse ball during work. The patient states he had no symptoms while going climbing, but reports symptoms arise later while at work. The patient reports having success with manual release technique but must do so repeatedly throughout the work week. The patient had no significant tender spots currently, but this therapy session was early in the work day so there had not been sufficient time for a trigger point to develop. Treatments performed were ART to right middle trap and rhomboid with the patient perform horizontal abduction with the right arm while the therapist provide and pin and stretch to any trigger point in the right middle trap and rhomboids. Instrument assisted soft tissue mobilization (IASTM) was also done to the patient's right rhomboid, middle and upper trap. Prone lateral glide HVLT manipulation was also done. The patient reported significantly reduced stiffness and range of motions improvements post treatment. To promote maintenance of these improvements the patient was shown 4 exercises to promote cervical stability and endurance with scapular motions. The patient was instructed to maintain and retracted neutral cervical posture while performing banded scapular retraction, bilateral reach and pull through and push up plus in quadruped position, and scapular wall slides with a foam roller. Each exercise was designed to enable the patient to use all of his scapular musculature in various plans while maintaining a retracted neutral cervical posture. The patient was asked to perform 2 sets of 10 repetitions of each exercise twice per day.

At visit 5, the patient reported a significant knot in his thoracic spine in spot #2 depicted in Figure 1. The patient reported intensity of the trigger point similar to week 1 and that he did not wake up with it. He reported that it was brought on after sitting at work for 40 minutes. The patient attempted to walk and perform self-release techniques but was unable to resolve symptoms completely. Initial treatments performed were ART to right middle trap and rhomboid with the patient perform horizontal abduction with the right arm while the therapist provide deep pressure to patient identified trigger point.

2 sets of 10 repetitions were performed in sitting. STM was also performed to the patient rhomboids, middle and upper trap in sitting. The patient reported that the knot had dissipated after manual techniques.

The patient's HEP was reviewed and dosage of stretches and therapeutic exercises were increased in frequency throughout the workday to every hour. This was designed to avoid the onset of symptoms after 40 minutes but to also be reasonable in the workplace. The patient was also educated on proper keyboard and monitor ergonomics. While this would normally be part of education for patient with neck pain in the workplace, this patient has worked for more than 10 years at this setting with the same set up with no issues, so the therapist was initially hesitant to make major changes to the workplace setup. With recent symptoms arising in the workplace the therapist thought it would be important to address any workplace factors effecting the patient's symptoms. After discussing the workplace set up and stress levels at work the therapist and patient noticed that his trigger points seemed to be associated with increased stress at work. The patient reported that during the previous couple work days, his stress levels have been higher than normal. Increased stress is an important factor contributing to chronicity of neck pain.<sup>2,4,5</sup> Deep breathing for 1 minute and rest breaks every 30-60 minutes were discussed with patient to reduce stress and symptoms during work. The patient was instructed to pay attention to his stress levels and associated symptoms at work with increased stretching and stress management exercises since he would be going on a work trip for the next week.

#### **Week 4: Treatment Session 6**

**Manual Therapy:** Right middle trap and rhomboid release with active horizontal abduction, IASTM to middle trap, rhomboids, and upper trap. Prone CTJ lateral glide HVLAT manipulation

**Therapeutic Exercise:** Deep neck flexor reeducation, bird dog with cervical retraction

**HEP:** Modified Quadruped reach and pull through, Deep neck flexor head nod with cervical rotation

At week 5, the patient reported for his 6<sup>th</sup> treatment session following a work trip earlier in the week. The patient recorded a FOTO score of 72/100, matching the risk adjusted predicted score, but still reported some functional deficits. The patient reported that on Tuesday of his work trip he experienced cervical and thoracic spasms with a return of the usual trigger point from Figure 1. The patient reported that the intensity was not as much as after the car accident. Treatments performed were ART to right middle trap and rhomboid with the patient perform horizontal abduction with the right arm while the therapist provide and pin and stretch to any trigger point in the right middle trap and rhomboids. Instrument assisted soft tissue mobilization (IASTM) was also done to the patients right rhomboid, middle and upper trap. Prone lateral glide HVLAT manipulation was also done. The patient reported significantly reduced stiffness and range of motions improvements post treatment. Right cervical rotation was found to be most limited and measured before treatment at 75 degrees. Post-treatment right cervical rotation was measured at 86 degrees.

The patient performed head nods in supine and progressed to performing supine head nods with rotation. This involved the patient to maintain a head nod while rotating the head left and right. The patient was instructed to perform 10 repetitions to pain-free end range. The patient was also instructed on progressing quadruped reach and pull through to add in more thoracic rotation by reaching vertically perpendicular to the floor for each repetition. The patient was asked to continue to perform current exercise with added modifications.

#### **Week 5: Treatment Session 7**

**Therapeutic Exercise:** Deep neck flexor reeducation, bird dog with cervical retraction

**HEP:** Travel Exercises- Cervical Stretches, Cervical Head Nod with Rotation, Cervical U, Bird-Dog with Cervical Retraction, Self-SNAG, Manual Trigger Point Release

The patient arrived on week 5 of therapy reporting being symptom free for the past 24 hours. He reported concern over neck symptoms returning on his two-week vacation following this therapy

session. To address these concerns, the patient was instructed on how to perform therapeutic exercises within a hotel room. The patient reported that he would be bringing along a lacrosse ball to provide manual relief to trigger points if necessary. Of the exercises previously given, the patient was instructed to perform cervical stretches, cervical U, cervical head nod with towel, and bird-dog with cervical retraction. The patient was instructed to perform each exercise once per night as time permitted while also performing manual trigger point release for tender spots and self-SNAG technique for range of motion limitations as needed.

### Week 8: Treatment Session 8

At the patient's final therapy session, he reported no symptoms and that he had enjoyed his vacation symptom free. The patient took another FOTO assessment and scored an 88/100. (Table 5) The patient was also asked at what percentage his current status was at with 0% being his status at initial eval and 100% being back to normal. The patient reported that he felt he was at 100%. With a complete resolution of symptoms and reported normal status the patient was discharged from therapy.

### Outcomes

At 8 weeks the patient reported complete resolution of symptoms. The patient reported no stiffness or trigger points throughout cervical or thoracic spine. The patient took a 2-week vacation between the 6<sup>th</sup> and 7<sup>th</sup> session and reported no symptoms while on vacation. The patient's FOTO scores also surpassed his risk adjusted predicted score of 72 (Table 5). The FOTO Risk adjusted predicted score is calculated using a multivariate linear regression method. Care Type, Impairment Type, Patient Severity at Intake, Age, Acuity, Number of Surgeries, Payment Source Type, Gender, Number of Other Health Problems, and Level of Fear at Intake are all risk-adjustment factors.<sup>15</sup> Cervical range of motion measurement during his final session are reported below in Table 3. The patient was discharged after he had met all his goals and had gone 2 weeks symptom free. The patient was advised to use muscle release techniques and therapeutic exercises as needed to manage any symptoms going forward. The patient was also encouraged to continue all current pain-free recreational activities.

**Table 5:** Focus on Therapeutic Outcomes (FOTO) Scores

FOTO	Initial Eval	4 wks	8 wks
Score (out of 100)	67	72	88

### Discussion

This case report describes patient who demonstrated signs and symptoms consistent with Whiplash Associated Disorder. During the initial evaluation, cervical and thoracic impairments were found. Initial interventions were focused on addressing the patient's acute pain, stiffness and range of motions impairments. The initial interventions were designed to address these impairments with the hope that this would prevent the development of chronic whiplash symptoms. Initial manipulations were directed at the thoracic spine based on evidence from Flynn et al,<sup>16</sup> who report pain reductions and increases in cervical range of motion follow upper thoracic spine manipulations. In this case the patient proved difficult to successfully manipulate his thoracic spine due to his severe kyphotic posture related to Scheuermann's disease. Modifications to the initial technique were needed to successfully manipulate the patient's thoracic spine. The main modification was performing a prone cervical thoracic junction (CTJ) lateral glide manipulation versus a supine thoracic gapping manipulation. With each

**Table 6:** Cervical range of motion at discharge and change from initial evaluation.

Direction	ROM (degrees)	Change (degrees)
Extension AROM	50	+10
Flexion AROM	70	+0
R. Lateral Flexion AROM	42	+2
L. Lateral Flexion AROM	50	+20
R. Rotation AROM	85	+25
L. Rotation AROM	90	+30

application of CTJ manipulation the patient noted significant reeducation in pain and stiffness as well as improvement in cervical range of motion. Although a cause and effect relationship cannot be established based on a single case report evidence from the study by Flynn et al,<sup>16</sup> and a case report by Pho C et al,<sup>9</sup> increase support for the relationship between addressing acute cervical AROM and pain impairments with upper thoracic manipulations.

The patient described in this study underwent 8 treatment sessions over 8 weeks and demonstrated a complete resolution of symptoms by week 8. The patient did present with a unique relapse of symptoms in week 4 of treatment with increased stress at work being a suspected cause. According to a study by Sterling M, Jull G, Kenardy J et al,<sup>4</sup> post-traumatic stress is associated with poorer outcomes 6-months following whiplash injury. Although the stress was attributed to work, it is not unreasonable to assume there is some stress associated with the patient's injury or that stress in general could influence the patient's symptoms. The interventions used to target this stress were managing the patient's stress at work through deep breathing and taking frequent breaks with therapeutic exercises. Utilizing early return to function through therapeutic exercises and stress management with deep breathing and work balance techniques were implemented with the goal of preventing the development of chronic symptoms.<sup>1,2,3,4,13</sup>

This case report was only able to follow this patient for 8 weeks, so more longitudinal data is needed to see if the patient did maintain a symptom-free status. The patient was able to go for two-week symptom-free during his vacation but ideally a follow-up at 6-months would provide adequate data to see if the patient had any relapses or chronic symptoms from his injury.

## Conclusion

Patients with acute whiplash-associated disorder often present with range of motion, pain, and stiffness impairments. The purpose of this case report was to describe the use of HVLTAT manipulations to treat acute cervical impairments and therapeutic exercises and neuromuscular reeducation to address chronicity of symptoms. This case report provides support that acute impairments such as pain and range of motion limitations may be addressed with thoracic manipulations. Also addressed in this study is cervical and thoracic impairment in the workplace addressed with manual techniques and therapeutic exercise. In this case report, the patient described was able to achieve complete resolution of symptoms with the described interventions, but more research would be needed to determine the efficacy of such treatments in the prevention of chronic whiplash symptoms.

## References

- 1 Childs J, Cleland J, Elliott J, Deydre T, Wainner R, Whitman J, et al. Neck Pain: Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability, and Health From the Orthopaedic Section of the American Physical Therapy Association. *J Orthop Sports Phys Ther.* 2008;38(9):A1-A34.
- 2 Rebeck T, Sindhausen D, Cameron ID, Rubin G, Feyer AM, Walsh J, et al. A prospective cohort study of health outcomes following whiplash associated disorders in an Australian population. *Inj Prev* 2006;12:93–8.
- 3 Stace R. and Gwilym S. « Whiplash associated disorder: a review of current pain concepts. » *Bone & Joint* 360, vol. 4, nr. 1. 2015.
- 4 Sterling M, Jull G, Kenardy J. Physical and psychological predictors of outcome following whiplash injury maintain predictive capacity at long term follow-up. *Pain* 2006;122: 102–8.

- 5 Walton DM, Elliott JM. An integrated model of chronic whiplash-associated disorder. journal of orthopaedic & sports physical therapy. 2017 Jul;47(7):462-71.
- 6 Jordan Miller, Anita Gross, Jonathan D'Sylva, Stephen J. Burnie, Charles H. Goldsmith, Nadine Graham, Ted Haine, Gert Brønfor and Jan L. Hoving. Manual Therapy, 2010-08-01, Volume 15, Issue 4, Pages 334-354, Copyright © 2010 Elsevier Ltd
- 7 BU PT623: MS III Spine Lab. Thoracic Manipulation. YouTube. <https://www.youtube.com/watch?v=AC5Xzmhkqzo>. Published December 14, 2014. Accessed December 8, 2018.
- 8 Nation PT. Prone Cervical Thoracic Junction Opening Manipulation. YouTube. [https://www.youtube.com/watch?v=0LS1k\\_hW2Bc](https://www.youtube.com/watch?v=0LS1k_hW2Bc). Published April 6, 2013. Accessed December 8, 2018.
- 9 Pho C. Management of Whiplash-Associated Disorder Addressing Thoracic and Cervical Spine Impairments: A Case Report. Journal of Orthopaedic and Sports Physical Therapy. 2004. doi:10.2519/jospt.2004.1393.
- 10 Focus On Therapeutic Outcomes, Inc. Usability, Validity, Sensitivity & Responsiveness Assessment for FOTO Outcomes Surveys 2010. [http://cdn2.hubspot.net/hub/442011/file-1970004540/pdf/docs/NQF\\_Usability\\_Assessment\\_Report.pdf?t=1425317786112](http://cdn2.hubspot.net/hub/442011/file-1970004540/pdf/docs/NQF_Usability_Assessment_Report.pdf?t=1425317786112) Accessed December, 2017.
- 11 Refshauge K, Bolst L, Goodsell M. The relationship between cervicothoracic posture and the presence of pain. J Manual Manipulative Ther. 1995;21-24.
- 12 Mulligan BR. Manual Therapy NAGS SNAGS MWMS etc. Wellington, New Zealand: Plane View Services; 2004.
- 13 Jull G. Deep cervical flexor muscle dysfunction in whiplash. J Musculoskeletal Pain. 2000;8:143-154.
- 14 Pastakia K, Kumar S. Acute whiplash associated disorders (WAD). Open Access Emerg Med. 2011; 3: 29-32.
- 15 FOTO Outcomes Scorecard. Website accessed 12/9/18. [http://cdn2.hubspot.net/hub/442011/file1964793301/pdf/docs/Outcomes\\_Scorecard.pdf?t=1444919726496](http://cdn2.hubspot.net/hub/442011/file1964793301/pdf/docs/Outcomes_Scorecard.pdf?t=1444919726496)
- 16 Flynn TW, Wainner R, Whitman J. Immediate effects of thoracic spine manipulation on cervical spine range of motion and pain [abstract]. J Man Manipulative Ther. 2001;165.