

The Effect of Kinesio Taping in Combination With Muscle Energy Technique in Patients With Mechanical Neck Pain – A case study

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Abstract:

This study explores the efficacy of combining Kinesio Taping and Muscle Energy Techniques (MET) to treat mechanical neck pain. A 29-year-old diabetic graphic designer with chronic neck pain participated. Measurements using the Visual Analog Scale (VAS), Goniometry, and Neck Disability Index (NDI) were taken at baseline and after six sessions over two weeks.

Results:

Significant improvements were observed in pain levels, cervical range of motion, and functionality. The combination of MET and Kinesio Taping effectively reduced disability associated with mechanical neck pain.

Keywords: Mechanical neck pain, Kinesio Taping, Muscle Energy Techniques, chronic pain, diabetic, functionality, range of motion, treatment efficacy.

Introduction

One of the major musculoskeletal dysfunction is considered to be mechanical neck pain and has been one of the common areas of discomfort and pain. Even though there has been immense advancement in treatment techniques and literature regarding spinal disorders, mechanical neck dysfunction is one of the most prevalent and expensive health issues throughout the world with a complex etiology and varied associated factors.¹

Mechanical neck dysfunction is one of the common dysfunctional syndromes involving the cervical spine, mostly characterized by intermittent pain, limited cervical range of motion and involvement of cervical spine musculature that is more prominently muscle dysfunction arising when the cervical spine is loaded. A plethora of impairments have been identified in association with mechanical neck pain which includes changes in the behaviour of the cervical muscles as well as changes in their physical structure.²

The prevalence of neck pain in the general world population is 23.1% and a point-prevalence of 13% to 22%.^{3, 4} According to studies there is a higher incidence of neck pain among women than men. Also in the age groups between 35-49 years there is an increased risk of developing neck pain whereas in later years the risk begins to decline.^{3, 4}

Mechanical neck pain is mostly due to postural dysfunction, trauma, overuse injuries or it might have an insidious onset. Sedentary lifestyle activities such as prolonged sitting on Non ergonomic workstations and computers, watching T.V., excessive mobile screen time with wrong cervical postures, desk jobs etc. are some of the major confounding factors of mechanical neck pain.⁵ It has been observed that recurrent neck pain in adults is primarily because of mechanical neck dysfunction.⁶

Background and Purpose

In the 1970s Kenzo Kase from Japan developed Kinesio taping as a passive intervention method that was clinically used for the management of pain and its use has become quite popular in recent years.⁷

Kinesio Taping is now one of the most widely implemented therapeutic modality that is used to treat and correct many musculoskeletal disorders. The creator of Kinesio Tape, Kenzo Kase attributed the therapeutic effect of Kinesio Taping to the following mechanisms: a) Taping effects on the weakened muscles by altering its muscle function, b) Improved blood and lymph circulation by mobilizing

tissue fluid beneath the skin, c) Reduction in pain through neurological suppression, d) Relieving abnormal muscle tension to facilitate repositioning of subluxed joints, e) Normalizes affected fascia and muscles thereby improving joint function.^{8,9}

Kinesio Tape is thin, air permeable, water resistant as well as adhesive. Due to its adherence properties that mimic the skin, it places a constant shear to skin and can be used for a prolonged period of 3-4 days without removal and has also been proposed to enhance proprioceptive sensibility.¹⁰

A modern shift in the change in lifestyle to a more sedentary condition may lead to poor muscular endurance which may in turn lead to poor postural alignment. To correct this, some studies have emphasized the role of Kinesio Tape in the correction of forward head posture and improving the function of deep cervical flexors.^{9,10}

One of the other most commonly used interventions to treat muscular dysfunction is Muscle Energy Technique (MET). MET incorporates voluntary contraction of the involved muscle in a specific controlled direction that is against a counterforce provided by the therapist. MET helps in reducing pain, increase joint mobility, reduce tight fascia, improve local blood and lymph circulation, facilitate in stretching tight muscles and also helps in strengthening weak musculature.¹¹

The therapeutic benefits of MET are most probably due to the focus on active component of muscle tone along with the passive structural aspects of the muscles, which in turn helps in reducing sarcomere activity by the mechanism of autogenic or reciprocal inhibition techniques.¹²

Studies have described mechanical muscular dysfunction in the cervical region in terms of an upper cross syndrome in which there is facilitation of the upper trapezius, sternocleidomastoid, levator scapulae and pectoralis muscles, whereas there is inhibition of lower trapezius, deep cervical flexors and serratus anterior. Movement dysfunctions arising due to these muscle imbalances could lead to a direct involvement of joint surfaces that may lead to joint degeneration. Pain can thus be mostly attributed to joint degeneration, but it has been observed that the actual cause may often be secondary to muscle imbalance.¹³

It has been suggested that before any attempt is made to improve the strength of weak muscles, the hypertonicity of the antagonist muscles should be tackled first by giving appropriate intervention that relaxes and lengthens it.^{11,13}

MET is a more contact heavy approach to induce muscle stretching as well as strengthening to alter muscle behavior and restore normal joint mobility and reduce pain. It has been used successfully as a rehabilitative therapeutic approach for non-specific mechanical neck pain.¹⁴

In physical therapy, the application of evidence-based practice is very essential and should be the fundamental component to facilitate the highest quality of care that can be available to patients. Both MET and Kinesio Taping have been used to treat mechanical neck pain, but there is a lack of evidence related to use of the intervention in combination. Thus the purpose of this case report is to explore and describe the therapeutic effect of Kinesio Taping in combination with Muscle Energy Techniques on mechanical neck pain.

Case Description:

Permission was taken from Singh Physiotherapy Clinic, Pune to conduct the study at their clinical premises. Before enrolment of the subject an informed consent was taken explaining the risks and benefits of the study and appropriate explanation regarding the study was provided to the participant.

Patient is a 29 year old Indian Male with a medical history of diabetes and chronic neck pain. Patient works as a graphic designer in an IT firm. Patient reports that he has had neck pain for over 2 months but it has aggravated since he shifted to his current job. Patient lives alone in an 11 story apartment building with an elevator.

Patient's chief complaint was his neck pain and difficulty in looking sideways. Patient reports that his pain gets worse with prolonged sitting as he has to work on his computer for more than 8 hours in a day. Patient has used local applicants and Ice packs to reduce the pain and had also tried physical therapy 2 months back which consisted of stretching exercises; electrical modalities including TENS

and also ergonomic advice to adapt at his workplace which he reports have not helped in reducing his pain.

The patient reports that he had also consulted a physician regarding the same and was advised to resume physiotherapy. The Patients goal is to reduce the neck pain and be easily able to move his neck as this discomfort has been interfering with his work and has been affecting his social life as well.

Clinical impression 1:

This patient is an ideal candidate for this study as he fits into the Mechanical Neck Pain category as he has chronic neck pain as well as limited range of motion. He has not had any surgical history related to his neck and also willing to take physiotherapy intervention to relieve his symptoms. As his condition is making it very difficult for him to work he is very well motivated to participate in treatment. There is also a possibility of a carryover effect and compliance with treatment and clear understanding of instructions makes him an ideal candidate. Moreover, the patient has some past experience with physiotherapy but was not exposed to targeted strengthening and mechanical correction of the cervical spine which may prove very beneficial in improving his condition. Also there was no intervention which had a prolonged effect like Kinesio Tape and hence any improvement in pain and disability from this intervention may be very beneficial for the patient as he would like to continue his work without any pain or discomfort.

Objective Examination and Evaluation:

The Patient was well oriented and alert. Vital signs read a Blood Pressure of 110/72 mm Hg, Pulse rate of 72 and a respiratory rate of 18 breaths/ minute. Patient complaints of significant neck pain, limited range of motion with difficulty looking over the shoulder, with limited range on the right side more than compared to the left. Pain, ROM and functional disability were assessed using the following valid and reliable tests and measures.

Outcome measures:

Neck Disability Index (NDI) disability questionnaire was the primary outcome measures used to quantify disability. This questionnaire is simple, easy to use and easy to understand. NDI has been most commonly used to evaluate disability of the neck and has been implemented in a variety of different clinical scenarios. Cronbach's alpha for the NDI scale was acceptable (0.864, 95% confidence limits [0.825–0.894]). The test–retest reliability of the NDI was high (ICC= 0.93, 95% confidence limits [0.86–0.97]). The MCID for NDI is 19%. It has also been shown that NDI has good reliability and validity and that it compares well with the SF36 as well.^{15,16,17} The patient was asked to complete the NDI and answer based on the statement they feel applies to them. It was administered at baseline and 2 weeks post intervention.

Pain was measured by Visual Analog Scale (VAS) which has high reliability and validity. It is one of the most commonly used methods for assessing pain intensity. It consist of a 100mm horizontal line scale where the start point a painless condition, which is represented by 0 and the end point represents extreme pain, which is represented by 100. The subjects rated their feelings of pain on the line by themselves, thereby quantifying the pain. The test-retest reliability was very high, with an interclass correlation coefficient (ICC) of 0.97.^{18,19}

Cervical ROM for Flexion, Extension, Rotation and side flexion was done by Goniometry. All the measures were taken at baseline prior to the intervention and after 2 weeks at the conclusion of the intervention. ([ICC= 0.79 to 0.97] intra-rater reliability and excellent inter-rater reliability [ICC= 0.79 to 0.92]).²⁰

Clinical Impression 2:

Patient scored 72% disability on NDI with pain of 79/100 VAS at the time of evaluation at baseline. The patient complains of pain while flexing the neck and at rotation with limited ROM on both sides due to pain. Pain was more evident on rotation and side flexion. Range of motion of the cervical spine is significantly limited. There was no significant spasm related to cervical muscles on initial evaluation. Due to the nature of the conditions above, the relative interventions in the study are

appropriate for the patient. The data was collected at the beginning and post 2 weeks after the intervention was complete. The study hypothesizes that the particular intervention will help in improving the patient's functional condition allowing him to get back to his work more efficiently.

Treatment Interventions:

MET: The first technique that was chosen for this patient was the Muscle Energy Technique of Post isometric relaxation. Post Isometric Relaxation was given to the targeted muscles especially Upper Trapezius and Levator Scapulae muscles. Patient was in supine position when the intervention was delivered. Post isometric relaxation technique was applied for five repetitions using 20% of maximal isometric contraction. In Post Isometric Relaxation the targeted muscles were held in isometric contraction for about 7-10 seconds followed by the stretch of the same targeted muscles. Stretch was held beyond the resistance barrier for 20 seconds.¹³

Kinesio Taping: Before the application of KT, a sensitivity test was carried out. A small piece of KT was applied for 24 hrs to the inner part of the arm prior to the intervention protocol and the area was checked for any allergic reaction to the tape adhesive. The tape used in this study was porous, air permeable, waterproof and adhesive which was 5 cm in width and 0.5 cm in thickness. KT application was done in sitting position. The posterior aspect of the neck was cleaned with water, and shaved for the proper application of the Kinesio tape. The first layer of the tape was a 15 cm Y - strip placed over the posterior aspect of the neck muscles. It was applied from the lower cervical region (T1–T2) to the upper cervical region (C1–C2) with a paper off tension of about ~15–25% stretch. The tail ends of the Y-shape strip was applied while the patient's neck is in a position of cervical contra lateral side flexion and rotation so as to better cover the posterior region. Another overlying 10 cm I- shaped strip was applied perpendicular to the Y strip over at the level of C3–C6 with moderate tension and the position of the cervical spine in flexion. The tape was applied and replaced every alternate days.²¹ (Image 1)

The above interventions were conducted for 3 times in a week for 2 weeks, thus consisting of 6 sessions, where each session lasted about 20-30 mins.

Outcome

The outcome measures used in the study were NDI, VAS and Cervical ROM. The data was collected at the initial evaluation and at the completion of the intervention protocol at 2 weeks. Patient has made significant functional improvements as evident by the improvement of the NDI score to 14% after 2 weeks compared to the pre 72% that was scored during the baseline assessment (Table 1, Graph 1). This led to an improvement of 58% which is more than the 19% MCID. Pain measures also showed significant improvements. The VAS score was reduced to 22/100 after intervention was completed post 2 weeks compared to the prior score of 79/100 at the baseline assessment (Table 1, Graph 2). Finally, there was a drastic improvement in the cervical range of motion in almost all ranges with significant improvements in lateral flexion and rotation especially on the right side (Table 2, Graph 3). The patient was very satisfied with the functional improvements in all domains as well as reduction in pain and increase in range of motion of the neck. The patient is able to carry out his work with much ease without being in significant pain.

Discussion

This study was conducted to examine the combined effect of Kinesio taping and Muscle Energy Technique on Mechanical Neck pain. One of the key factors to consider was the patient's workload that might be one of the predisposing factors of the mechanical neck pain. As the patient was bound by long working hours, there was a need of an intervention that would have a sustained effect on the structural and soft tissue components as well as provide a mechanical correction of the cervical spine. This might be the reasons the previous intervention taken by the patients might not have been that effective. Combining MET and KT not only provided stability to the cervical structures but also

maintained the effect through the Kinesio Tape's constant proprioceptive response. The results of this study showed that, combining both MET and KT was effective in improving the cervical range of motion and decreasing pain as well as reducing disability arising due to mechanical neck pain. The MET technique that was employed was post isometric relaxation and one of the possible mechanisms by which MET was effective in reducing pain intensity might be the inhibitory Golgi tendon reflex. The inhibitory Golgi tendon reflex, when activated during an isometric contraction, leads to reflex relaxation of the targeted muscle. This effect on the targeted muscle accompanied by activation of joint mechanoreceptors leads to sympathoexcitation evoked by somatic afferents and activation of the periaqueductal gray matter that leads to modulation of pain using the descending pathways.¹³ There was also a significant improvement in the cervical ROM. This can be explained by MET's effect on the physiological components involved in the change of muscle extensibility that includes reflex relaxation, variations in stretch tolerance and changes in the viscoelastic elements of the muscle. As post isometric technique is a complex intervention involving both contraction and stretching, this combination is more effective in causing viscoelastic changes in the muscle along with increased extensibility, which in turn may allow an increase in the cervical joint play resulting in an increased range of motion.¹¹

Many studies have showed that MET is an effective intervention in reducing pain and improving function related to mechanical neck pain. A study done by Gupta et al showed MET technique of post isometric relaxation was more effective in reducing nonspecific neck pain and function when compared to isometric exercises alone.²² Another study by Abha and Angusamy that compared MET with integrated neuromuscular inhibition technique on upper trigger points showed that MET is effective in reducing pain and improving function.²³

Following MET, Kinesio taping was done. One of the proposed mechanisms by which Kinesio taping might have been effective is its mechanical influence on the length of the muscle fibre as well as creating a shift in the length-tension curve of the targeted muscles by relative changes in the joint position along with influencing the muscle fibre's direction.²⁴ The other mechanism is the increased proprioceptive input due to the cutaneous stimulation provided by the tape by stretching the skin which may lead to more kinaesthetic information to the central nervous system allowing a neural feedback that facilitates the patient's ability to move the cervical spine with lesser mechanical irritation further allowing the correction of the postural imbalance present at the cervical spine.²⁴ There is also a strong relationship between neck pain intensity and cervical proprioception and vice versa, that may have resulted in the reduction of pain as proprioception was enhanced by Kinesio Taping. Furthermore, KT may improve vascular and lymphatic circulation along with correction of possible articular misalignments to reduce the functional disability of the patient.¹⁰

Several studies have also shown improvement in neck disability and pain using Kinesio taping. A study done by González-Iglesias et al showed that Kinesio taping was effective in improving neck pain and cervical range of motion when compared with sham taping in patients with acute whiplash disorder.²⁵ Another study done by Dawood et al compared cervical traction pump with Kinesio Taping in patients with mechanical neck dysfunction. They concluded that both Kinesio taping is equally effective as cervical traction pump in reduction neck disability and improving neck pain and cervical range of motion.⁵

Thus, in this study the combined effect of Kinesio taping and MET has shown to be effective in treating mechanical neck pain. Despite being a case study, the results show that the combination of the two interventions have a lot of potential to be used as an effective strategy in treating patients with mechanical neck pain and need further studies, probably with a control group and larger sample size. Further research is also required to observe the physiological effect of the combination of Kinesio taping and MET on the structural and biomechanical aspects of the cervical spine.

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TABLES:

Table 1: NDI & VAS scores

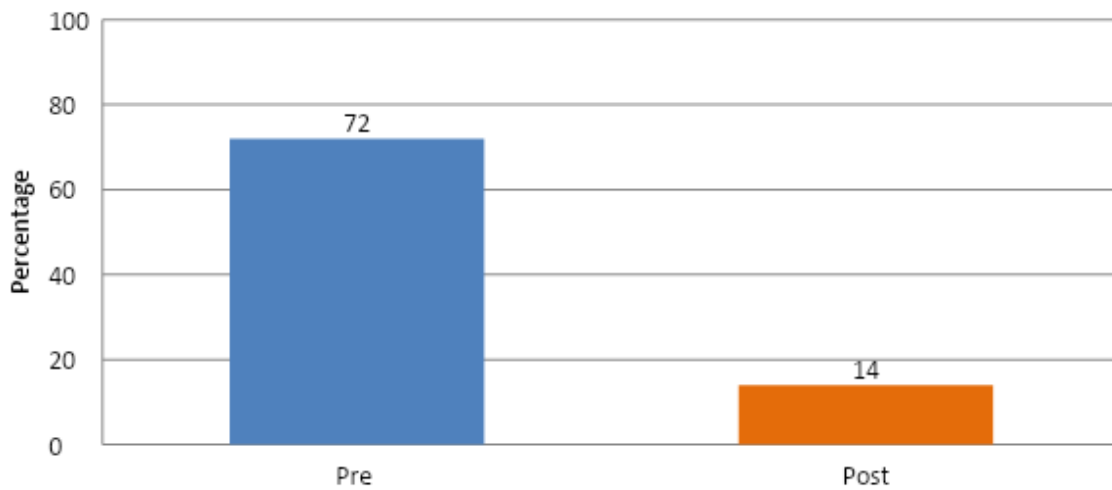
Outcome measures	PRE	POST
Neck Disability Index	72%	14%
Visual Analog scale	79/100	22/100

Table 2: Cervical Range of Motion

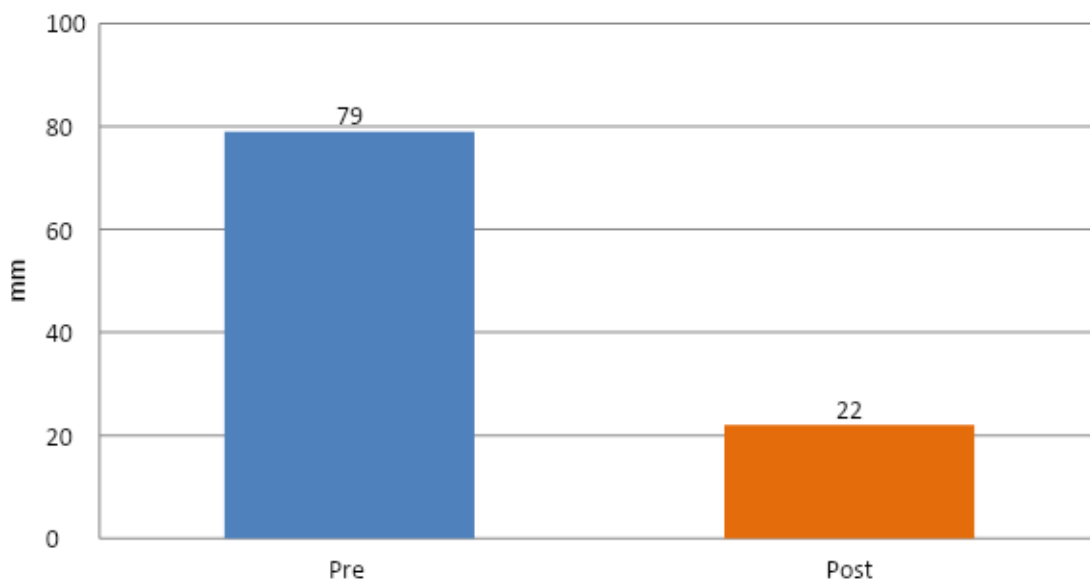
Cervical ROM	Pre	Post
Flexion	35	52
Extension	42	60
Lateral Flexion Right	25	40
Lateral Flexion Left	30	45
Rotation Right	40	65
Rotation Left	45	70

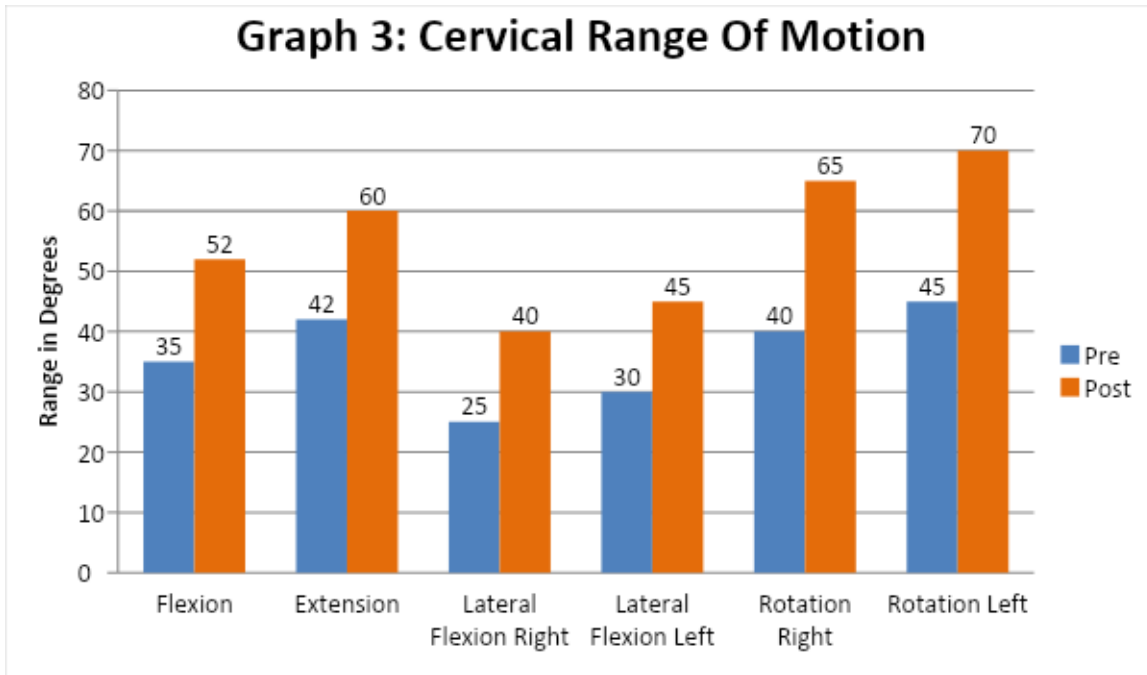
GRAPHS:

Graph 1: Neck Disability Index



Graph 2: Visual Analog Scale





Images:



Image 1: Kinesio Taping of the cervical region

APPENDIX: NECK DISABILITY INDEX

NECK DISABILITY INDEX

THIS QUESTIONNAIRE IS DESIGNED TO HELP US BETTER UNDERSTAND HOW YOUR NECK PAIN AFFECTS YOUR ABILITY TO MANAGE EVERYDAY -LIFE ACTIVITIES. PLEASE MARK IN EACH SECTION THE **ONE BOX** THAT APPLIES TO YOU. ALTHOUGH YOU MAY CONSIDER THAT TWO OF THE STATEMENTS IN ANY ONE SECTION RELATE TO YOU, PLEASE MARK THE BOX THAT **MOST CLOSELY** DESCRIBES YOUR PRESENT -DAY SITUATION.

SECTION 1 - PAIN INTENSITY

- I have no pain at the moment.
- The pain is very mild at the moment.
- The pain is moderate at the moment.
- The pain is fairly severe at the moment.
- The pain is very severe at the moment.
- The pain is the worst imaginable at the moment.

SECTION 2 - PERSONAL CARE

- I can look after myself normally without causing extra pain.
- I can look after myself normally, but it causes extra pain.
- It is painful to look after myself, and I am slow and careful.
- I need some help but manage most of my personal care.
- I need help every day in most aspects of self-care.
- I do not get dressed. I wash with difficulty and stay in bed.

SECTION 3 - LIFTING

- I can lift heavy weights without causing extra pain.
- I can lift heavy weights, but it gives me extra pain.
- Pain prevents me from lifting heavy weights off the floor but I can manage if items are conveniently positioned, ie. on a table.
- Pain prevents me from lifting heavy weights, but I can manage light weights if they are conveniently positioned.
- I can lift only very light weights.
- I cannot lift or carry anything at all.

SECTION 4 - WORK

- I can do as much work as I want.
- I can only do my usual work, but no more.
- I can do most of my usual work, but no more.
- I can't do my usual work.
- I can hardly do any work at all.
- I can't do any work at all.

SECTION 5 - HEADACHES

- I have no headaches at all.
- I have slight headaches that come infrequently.
- I have moderate headaches that come infrequently.
- I have moderate headaches that come frequently.
- I have severe headaches that come frequently.
- I have headaches almost all the time.

SECTION 6 - CONCENTRATION

- I can concentrate fully without difficulty.
- I can concentrate fully with slight difficulty.
- I have a fair degree of difficulty concentrating.
- I have a lot of difficulty concentrating.
- I have a great deal of difficulty concentrating.
- I can't concentrate at all.

SECTION 7 - SLEEPING

- I have no trouble sleeping.
- My sleep is slightly disturbed for less than 1 hour.
- My sleep is mildly disturbed for up to 1-2 hours.
- My sleep is moderately disturbed for up to 2-3 hours.
- My sleep is greatly disturbed for up to 3-5 hours.
- My sleep is completely disturbed for up to 5-7 hours.

SECTION 8 - DRIVING

- I can drive my car without neck pain.
- I can drive as long as I want with slight neck pain.
- I can drive as long as I want with moderate neck pain.
- I can't drive as long as I want because of moderate neck pain.
- I can hardly drive at all because of severe neck pain.
- I can't drive my care at all because of neck pain.

SECTION 9 - READING

- I can read as much as I want with no neck pain.
- I can read as much as I want with slight neck pain.
- I can read as much as I want with moderate neck pain.
- I can't read as much as I want because of moderate neck pain.
- I can't read as much as I want because of severe neck pain.
- I can't read at all.

SECTION 10 - RECREATION

- I have no neck pain during all recreational activities.
- I have some neck pain with all recreational activities.
- I have some neck pain with a few recreational activities.
- I have neck pain with most recreational activities.
- I can hardly do recreational activities due to neck pain.
- I can't do any recreational activities due to neck pain.

PATIENT NAME _____

DATE _____

SCORE _____ [50]

BENCHMARK -5 = _____

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