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Research report

Immediate changes in radiographically determined lateral flexion range of motion following a single cervical HVLA manipulation in patients presenting with mechanical neck pain: A case series

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Abstract

Background: It is generally assumed that inter-vertebral joint dysfunction results in a temporary reduction of mobility of a spinal segment and it has been purported that spinal manipulation can directly affect the biomechanical behaviour of the spine. Functional X-rays are used to assess dynamic alterations of spinal function.
Objective: The aim of this case series was to describe the immediate changes of inter-vertebral motion at an identified dysfunctional cervical segment, as measured by functional X-rays in lateral flexion, following a supine cervical rotation manipulation in patients presenting with mechanical neck pain.
Methods: Fifteen patients who presented with mechanical neck pain and who exhibited inter-vertebral joint dysfunction at C3–C4 or C4–C5 levels were recruited to participate in this case series. The radiological distance between the transverse process of the identified hypomobile vertebra and the transverse process of the subjacent vertebra, was measured pre- and 5 min post-manipulation during contralateral side flexion.
Results: Analysis of the pre-post-intervention radiographs showed a significant increase ($P = 0.01$) of the distance between the transverse process on the dysfunctional side following cervical manipulation. The mean pre-manipulative inter-vertebral radiological measurement was 18.9 mm (SD 2.1), and 20.6 mm (SD 2.1) at the post-manipulative assessment.
Conclusions: These preliminary results demonstrated a trend toward an increase in inter-vertebral motion at the hypomobile segment, measured by functional radiography.

Keywords: Osteopathic medicine; Mechanical neck pain; Zygapophyseal joint; Cervical manipulation; Inter-vertebral radiological motion; Functional radiography

1. Background

Mechanical neck pain affects 45–54% of the general population at some time during their lives[1] and can result in severe pain and disability.[2] The exact pathology of mechanical neck pain is not clearly understood but has been purported to be related to various anatomical structures including zygapophysial joints, uncovertebral joints, inter-vertebral discs, neural tissues, muscular disorders and ligaments.[3] It has been hypothesised that the pathogenesis of mechanical neck pain is mainly produced by zygapophysial joint dysfunction or hypomobility.[4] Cervical joint dysfunction, known also as somatic

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dysfunction, inter-vertebral joint dysfunction, chiropractic subluxation, and hypomobility by the various manipulating professions,[5] is defined as a reduction of mobility of a cervical segment,[6] and if identified on clinical examination is often the focus of treatment for mobilisation/manipulation.[7]

Previous studies have demonstrated that spinal manipulative therapy is effective in reducing pressure pain threshold[8] and increasing cervical range of motion[9–11] in patients presenting with mechanical neck pain; while another study has reported no lasting changes in passive cervical range of motion occur after spinal manipulation.[12] It is generally assumed that inter-vertebral joint dysfunction provokes a reduction of mobility of a spinal segment and that spinal manipulation may improve motion thus affecting the biomechanical behaviour of the spine.[6] The identification of joint hypomobility is a common criteria used as an indication for the application high velocity-low amplitude (HVLA) techniques. If identification of inter-vertebral dysfunction is accurate and the spinal manipulation procedure is precise, the biomechanical behaviour of that spinal segment should be expected to exhibit an increase in range of motion.[9–11]

Typically the study of the effects of spinal manipulation on the kinematics of the cervical spine entails radiological and goniometric studies. Functional radiographs are commonly used to assess positional abnormalities and potential instability of the spinal segments. Yeomans[13] assessed changes on inter-segmental motion with functional radiography in flexion extension and reported an increase in mobility after the manipulative procedure directed at the cervical spine. However, in the clinical setting, cervical hypomobility is usually identified either at the left or the right aspect of an inter-vertebral segment. Therefore, the radiological analysis of the inter-segmental motion of the hypomobile segment should be a unilateral analysis, for example in lateral flexion. The aim of this case series was to describe the immediate changes of inter-vertebral motion at a cervical segment identified as hypomobile by functional radiography in lateral flexion, after a supine cervical rotation manipulation in patients presenting with mechanical neck pain. It was hypothesised that measurements taken after the manipulative procedure would exhibit an increased inter-vertebral motion at the dysfunctional segment.

2. Materials and methods

2.1. Subjects

Fifteen patients who presented with mechanical neck pain and who were referred by their primary care physician to a private clinic of osteopathy in Madrid, Spain, from January to June 2004 were recruited to participate in this case series. For the purpose of this study mechanical neck pain was defined as generalised neck and/or shoulder pain with mechanical characteristics including: symptoms provoked by maintained neck postures or by neck movement and/or by palpation of the cervical muscles. Inclusion criteria included: (1) patients suffering from mechanical neck pain of at least 1 month in duration; and (2) clinical presentation of inter-vertebral joint dysfunction at C3–C4 or C4–C5 levels diagnosed by the lateral gliding test. Patients were excluded if they exhibited any of the following: (1) any contraindication to manipulation; (2) diagnosis of fibromyalgia syndrome[14] (3) previous history of whiplash injury; (4) history of cervical spine surgery; (5) diagnosis of cervical radiculopathy or myelopathy determined by their primary care physician; (6) having undergone spinal manipulative therapy within the past month before the study; (7) exhibiting a positive extension rotation test[15] or (8) less than 18 years old. The clinical history for each patient was solicited from their primary care physician to assess the presence of any exclusion criteria or 'red flags', e.g. infection, osteoporosis. All patients provided informed consent prior to beginning the trial. This case series was supervised by the Department of Physical Therapy, Occupational Therapy, Physical Medicine and Rehabilitation of the Universidad Rey Juan Carlos and the International School of Osteopathy in Madrid (EOM). The study protocol was approved by the local Committee in Clinical Research of the University.

2.2. Procedures

All patients were examined by therapist 1 (jointly qualified osteopath and physical therapist), who had more than 5 years experience in the assessment of joint dysfunction, for the presence of joint hypomobility in the cervical spine. The therapist used the lateral gliding test for the cervical spine as described by Greenman[16]

1. The patient is supine with the cervical spine in a neutral position.
2. The therapist places the fingers over the zygapophyseal joints of a specific cervical vertebra.
3. The examining therapist laterally glides each vertebra from right to left and from left to right (Fig. 1).

Passive lateral gliding, end-feel and reproduction of the patients' symptoms were assessed. Patients who demonstrated restricted mobility in lateral gliding were included. The lateral gliding test had to be associated with a reproduction of the patient's neck pain as a criteria for the presence of inter-vertebral joint dysfunction.[17] The clinician recorded the level and the side of any identified dysfunction. Our research group has recently validated the lateral gliding test for the cervical