Asia-Pacific Chiropractic Journal

CLINICAL EVIDENCE

Vision induced chronic low back pain:

A case report

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Introduction: A 34-year-old female patient presented with a history of low back pain (dull, achy, and non-radiating) that had been present for nearly two-years.

Methods: The patient reported complete relief of her chronic low back pain with her eyes closed or in a darkened room, whereas the pain would return when opening her eyes and particularly in a lightened room, with or without eyeglasses.

Treatment: Osteopathic manipulative therapy (OMT) to the full body and cranium was applied with the patient's eyes opened, closed, and eyeglasses on and off. Modifications were made to the optometric prescription and eyeglasses to optimise body and cranial function as well as to reduce her low back pain.

Results: The patient noted considerable relief in her low back pain with the new eyeglass prescription, and this relief was sustained regardless of eyes open or closed, and particularly with her eyeglasses on.

Conclusion: This case study illustrates that a subset of patients may present with a clinical condition that either affects vision or where the vision affects the condition, called a visual somatic strain. This demonstrates how collaborative efforts might be made to develop co-treatment opportunities between osteopaths, chiropractors, ophthalmologists, and other allied professionals.

Indexing Terms: Chiropractic, Osteopathy; Cranial; Visual Somatic Strain; LBP

Introduction

What direct relationship might the eyes or vision play in the causation of low back pain or other symptoms related to physical changes in the fascia (both internally and externally) of the cranium? If the eye muscles, visual reflex centres, or other neurologically related circuitry have a direct relationship with sustained myofascial imbalance, this may be an important part of a clinical differential diagnosis.

'... A relationship is shown among vision (and glasses), cranial findings, and somatic findings presenting as LBP. An appreciation of and attention to these relationships is associated with good clinical outcomes...'

A series of case reports involving both spinal and cranial manipulative interventions have discussed a relationship between vision and successful treatment. (1, 2, 3, 4)

Monaco et al. found a positive correlation between ocular correction effects on EMG activity of stomatognathic muscles in children (n=320) with functional mandibular lateral-deviation in a case control study. This showed a relationship between standard prescriptive ophthalmic evaluations and how they could be

improved with a functional assessment tool to evaluate any related myofascial interrelationship . (5)

Weiner et al. performed the first published case series study (n=6) evaluating the use of cranial manipulative treatment of patients utilising ocular changes for treatment purposes. They found '*significant changes in ocular refraction, corneal curvature, and ocular position noted and measured as a concomitant of the use of dental appliances and/or osteopathic craniosacral manipulations in ongoing therapies for treatment of temporomandibular joint (TMJ) syndrome and other related head, neck, and shoulder problems. The near-immediacy in time of these variations and the absence of other reasonable causes suggest that precise monitoring of these patients before treatment begins and during subsequent therapy can assist the practitioner in quantifying the progress and effects of the treatment of chronic head, neck, and swallowing problems*'. (6)

Their six case histories demonstrated '*significant changes in hypereye, proptosis, corneal astigmatism (and axis), and refractive error. The magnitude of these alterations ranges from 25% to 300% of the pretreatment condition*'. (6) They cautioned that '*while the subjective symptom improvement of these cases would have to be regarded as anecdotal, visual parameter analysis of a large patient population may help to provide predictive cause and effect assumptions.*' (6)

Therefore the purpose of this study is to report any relationship clinically evident between vision and its affect on the cranium, stomatognathic system and posture, and whether this relationship can be used for both assessment and treatment of patients in an interrelated and interdisciplinary manner.

Case History

A 34y white female patient presented with a history of low back pain that has been present for nearly two years. She was currently being seen by her gynaecologist for the treatment of hypothyroidism and taking bio-identical hormone supplementation for irregular menses. Her gynaecologist referred her to the clinic for a musculoskeletal evaluation of her back pain. She was cheerful on initial presentation and indicated that her back is the only real issue and concern. She stated that other than her back she '*feels fine*'. Her symptoms improved with rest and sleep and worsened as the day progressed. The pain was described as dull, achy, non-radiating, and she points to her lower lumbar spine when asked about its location. She rated the pain as an 8 out of 10, with 10 being most severe.

The patient denied any trauma associated with the onset and further denied any motor vehicle accidents, slips or falls, or other trauma. The patient was employed as an accountant at a local large company. She stated that her back pain is '*just getting worse*'. When asked how long the pain had been present, the reply was '*… 2 years*'. In questioning what else might have happened in the time period in her life she responded '*I can't remember any trauma, but that's when I had my bilateral lens implants*'. The patient stated that the surgery was for her poor vision and that she had been able to see well since the surgery and had not needed corrective lenses to read the Snellen chart. She denied any other traumatic or pathologic visual problems including: *amblyopia*, *anisometropia*, *diplopia*, *strabismus*, *glaucoma*, *ophthalmoplegia*, *pterygium*, *retinitis*, or *macular degeneration*.

Her predominant medical condition was recently diagnosed as *hypothyroidism* and hormone imbalance. Surgically of note was the bilateral lens implants in 2006. Medication included *Iodine Plus* tablets, 50 mg per day for *hypothyroidism*; progesterone cream, 0.1 mg daily applied topically. Aside from infrequent mild headaches her main musculoskeletal complaint is the chronic low back pain (L4-S1).

Methods

Osteopathic manipulative therapeutic evaluation revealed her cranium to be the area of the greatest restriction, with tissue texture changes noted at the suboccipital region. The right occipitomastoid suture was restricted. She had two mildly exaggerated kyphoses, focused around the cervicothoracic junction and at the T7 vertebra. The C2 vertebra was rotated right. The thoracic outlet was restricted fascially in left rotation, the C7 vertebra was ERSR (Extended, Rotated and Side-bent-Right), the right 1st rib joint exhibited an exhalation somatic dysfunction, there was increased paravertebral muscular tension noted bilaterally between T1-T5 and L3-S1. L5 was ERSR (Extended, Rotated and Side-bent-Right). Additionally, there was left superior innominate shear misalignment, left superior pubic shear misalignment, left/right sacral torsion, and a right anteriorly rotated innominate.

After an initial screen and repeated questioning about the back pain, the blinds in the exam room were closed and the patient was informed that the lights would be switched off. The patient was seated on the exam table, the lights were switched off and she was allowed to remain motionless for approximately 30 seconds in the darkened room. This experiment is a test for somatic dysfunction that was induced or exaggerated by light (visual somatic strain). When asked at the end of this period how her pain was, she replied '*It's gone*'. The lights were turned on and she was asked again about her back pain. She reported that it had returned. This experiment was repeated for a total of three times until the patient and the physician were convinced that her back pain was related to her eyes. She was then re-examined in the darkened room and, although her somatic dysfunction was still present, its severity was significantly lessened.

The patient was examined cranially with her eyes closed in a darkened room. She was then examined with her eyes open in a lighted room. This was done to maximise the differences. The cranial rhythm presented with good amplitude in the darkened, eyes-closed exam, but was restricted in the lit, eyes-open exam. She was also noted to have a marked lateral strain, a minor cranial flexion, and increased tension in the suboccipital muscles present in the lit, eyes-open exam that was absent in the darkened, eyes-closed examination.

She was assessed with a history of headaches and low back pain worsened by visual input. She presented with *hypothyroidism*, *hirsutism*, an irregular menstrual cycle as well as somatic dysfunctions of the cranium, cervical, thoracic and lumbar spine, sacrum, pelvis and rib cage.

Treatment

Osteopathic manipulative therapy (OMT) was performed to all areas listed above utilising functional, balanced ligamentous tension, muscle energy, and facilitated positional release techniques.

The cranium was treated with a combination of indirect and direct sutural and fluid techniques. The patient tolerated the treatment well. She was then evaluated for cranial strain with her eyes closed and covered to occlude any incoming light. The same evaluation was then performed with the eyes open and the results were compared. With her eyes closed and covered she was found to have no cranial strains present, as she had just undergone treatment to remove the above noted occipitomastoid strain. When the cover was removed and the eyes opened the patient's cranial appearance immediately changed with noted strains of mild, but perceptible cranial extension, a mild right torsion, and a pronounced left lateral strain pattern. It was decided at this time to prescribe eyeglasses to neutralise the cranial strains. Utilising ophthalmologic principles as they relate to Osteopathy in the Cranial Field the prescription that neutralised her cranial strains was:

OD: -0.12 sphere, DS (no astigmatism)

OS: -0.12 sphere, -1.12 x 77° cylinder

The numbers represent an eyeglass prescription. The first minus signifies near-sightedness; the number is the strength of the lens n diopters (sphere). The second set of numbers (if present) is the astigmatism. The minus being the strength of the lens in diopters and the degree number is the axis of rotation of that lens (cylinder).

The patient was instructed to get this prescription filled with metal, full-rim frames and to return in two weeks. She was asked to call the office if she needed any assistance before then.

The patient returned in two weeks with the new eyeglass prescription. She noted 80% symptomatic relief in lower back pain with this prescription prior to her entering the office. She noted that her pain had dropped to a '2' on a 10 scale. She was assessed cranially and the frames were fitted to her face using ophthalmologic principles; optical centres of the lenses were centred on the pupils by adjusting the nose pads (this corrected a small right torsion), temple arms were adjusted to keep the frames on the face (temple bend), face form was adjusted until the minor superior vertical strain was removed, the frames were 'x'd' with the right lower portion of the lens moving toward the face to remove a small left side-bending rotation, and the pantoscopic tilt was adjusted to balance the muscle tension of the suboccipital muscles. The patient was instructed in care of the glasses and what to expect from the eyeglass treatment. The patient was then evaluated structurally and found to have the area of greatest restriction at L5 ERSR (Extended, Rotated and Side-bent-Right), followed by L3 FRSL (Flexed, Rotated and Side-bent-Right). These were treated utilising functional methods. The patient left the office symptom free (pain now a '0'). Follow-up examination was scheduled for two weeks.

At her second follow up appointment she reported that her headaches had not returned at all since the initial evaluation and treatment and that her back pain was greatly improved, but not completely resolved. Evaluation for this visit revealed that the pelvis was the area of greatest restriction, with a left superior innominate shear, left superior pubic shear, left/right sacral torsion and right anteriorly rotated innominate (it was noted that the end feel of this motion was markedly better than her initial visit). She was treated using a combination of high velocity/low amplitude, muscle energy and functional techniques. Her glasses were evaluated cranially and did not need further adjustment at that time.

This patient has been followed for over two years with approximately monthly visits for osteopathic manipulation and checkups on her glasses. She has had two minor revisions on her prescription. Both times the right eye did not change, but after the first revision, the left eye no longer needed any spherical correction (plano). While her back pain has been significantly reduced we are evaluating the need for prolotherapy to see if that could help alleviate any residual low back discomfort or instability.

Discussion

In this case the patient's symptoms appeared to be a direct result of visually induced somatic strain influencing the cranial bones and causing headaches and chronic lower back pain. This explanation seems reasonable because of the patient's unresponsiveness to other forms of care, her positive response to the OMT and cranial care, the comparative diagnosis evaluating patient with eyes open and closed or with and without light, the ophthalmological prescriptive modification and then modification of the eyeglasses.

Diagnoses of cranial strain patterns consisted predominately of palpatory tests for the following patterns, which are commonly found in cranial osteopathic examinations 7:

- flexion
- extension
- torsion (left or right)

- side-bending rotation (left or right)
- lateral strain (left or right)
- vertical strain (superior or inferior)
- compression

Testing for inter- and intra-examiner reliability of cranial bone dynamic patterns has been performed with some success. (8, 9, 10, 11, 12,13) A recent study had particularly significant findings for intra-observer reliability for cranial strain patterns as were used in this case report. (14)

In this case the majority of the patient's symptoms appeared to be a direct result of visual somatic strain influencing the cranium and causing lower back pain and other complaints. It can be reasoned that her uncorrected eyestrain (astigmatism) resulted in abnormal tension (lateral strain) on the cranial bones that induced the strain patterns that resulted in the patient's lower back pain. This was noted by comparing the patient's cranial movement and strain patterns with the eyes closed and covered (no visual input) with the eyes open (visual input). The process of light entering the patient's visual processing system resulted in cranial strain (visual somatic strain). This strain was neutralised with eyeglass lens and frame adjustments. This reduced the strain on the patient's cranium so that it no longer adversely influenced the lumbar and sacral area via the dura and its connections. The eyes were able to relax and not place abnormal tensions on the cranium.

Postural reflexes can be subcategorised as the following:

- visual righting reflexes
- labyrinthine righting reflexes
- neck righting reflexes
- body on head righting reflexes, and
- body on body righting reflexes. (15)

Therefore it is possible for visual righting mechanisms to have an influence on posture which could affect the ability of the low back to respond to head/neck postural righting. This may be a contributing factor in some patients presenting with vision-related low back pain. Vision, craniomandibular, cervical and postural balance have been found to have clinical interrelationships. (16, 17, 18)

Baroni et al. (19) evaluated two astronauts during space flight using kinematic analysis: '*The astronauts were instructed to perform specific axial movements from an erect, upright posture. Their results suggest that visual input for postural control may be independent of gravity-based postural cues.*' (20) Another seemingly unrelated study found that a stress response to respiratory systems in women consisted of an increase in vision, headache, and back pain. (21) It is not clear in the case presented in this paper whether the increased stress secondary to hormonal imbalance may have been related to her particular condition.

With this patient the pantoscopic tilt of her glasses was a major influence on her postural muscle tension. Pantoscopic tilt (which is the degree of vertical tilt of the lens toward the cheek), (22) can significantly influence the suboccipital muscles of the neck (and dura) directly, (23, 24) and all of the other postural muscles indirectly.

The prismatic effect from light entering the tilted lens of the eyeglasses causes light to deflect (prism) superiorly or inferiorly from the patient's perceived horizon line. (25) If the resulting light does not strike the fovea, the head corrects for this by moving the chin superiorly or inferiorly. (25) This correction results in a prismatic effect on the light entering the lens of the eye

that opposes the external prism and returns the focus to the fovea. (25) This optical correction affects the postural muscles that are now required to hold the head at a non-neutral location on the neck. (25) This prismatic effect and its influence on the body can be noticed in automobiles with sloping glass, eyeglasses, and even seemingly eutropic individuals whose fovea do not receive light from the perceived horizon. (25)

The anatomical relationship between the cranial and sacral dural attachments (26) could result in lower back pain (27) if the dura was placed under tension from the body's correction of a prismatic effect. When combined with the strain on the postural muscles from the non-neutral head tilt, lower back pain with a visual origin may result.

This patient's case had an initial straightforward presentation, but her pain was not completely due to visual somatic strain. Even after visual correction her symptoms did not completely resolve. Subjectively her pain improved by 80%. Thus, the majority of her pain may be related to a visual somatic strain, since it resolved after prescribing and adjusting eyeglasses.

Much of the knowledge of osteopathic visual somatic strain has come about in the last ten to fifteen years from Jim Jealous DO, Joe Field DO, Paul Dart MD and others. They have mapped out the effects of visual strain on the cranial system and worked out corrections for these problems.

In this case, the patient's eyes were not adequately assessed after her surgery to find out if any visual correction was necessary. The patient likely slipped through the system because her vision had no major disturbances. She was able to see 20/20 without correction, although she had some blurriness with her left eye when tested alone. She met the legal requirements to operate a motor vehicle and the standard of care was met. (28) However, her left eye astigmatism led to a persistent lateral strain (from non-corrected cylinder), flexion lesion (from non-corrected sphere), and torsion (from non-corrected cylindrical axis). (25) These effects of her lens implants were present even with her eyelids closed, but were increased when she opened her eyes. (25) Lateral strains are a non-physiologic pattern and can cause headaches. (29) These strain patterns can restrict motion of the extraocular muscles and can lead to ophthalmologic migraines and back pain. (30) There is a reciprocal relationship between the cranium and the pelvis due to the dural attachments. This contributed to this patient's low back pain and headaches.

Conclusion

This case study illustrates that a subset of patients may present with a clinical condition that either affects vision or the vision affects the condition. This dynamic interrelationship can be classified as a visual somatic strain.

Functional assessments to evaluate for a visual somatic strain can be used to improve the neuromusculoskeletal head, neck, and postural kinematics where vision plays an important role. Collaborative efforts can be made to develop interdisciplinary co-treatment opportunities between osteopaths, chiropractors, podiatrists, ophthalmologists, dentists, and other allied professionals so that the sufferers of the effects of visual somatic strain can be helped and their quality of life improved. Further research into this phenomenon should be undertaken initially with case controlled and clinical based studies.

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Cite: Beck C, Blum CL. Vision induced chronic low back pain: A case report. Asia-Pac Chiropr J. 2023;4.1. URL apcj.net/papers-issue-4-1/#BeckVisionLBP

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