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When Strabismus Twists the Spine: Undiagnosed Strabismus Leading to Torticollis and Scoliosis

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Introduction

Ocular torticollis is a compensatory head posture adopted to optimise binocular vision. When an ocular misalignment goes unrecognized and untreated during development, the persistent head tilt or turn can lead to permanent musculoskeletal changes. Over time, chronic abnormal head postures may cause contracture of neck muscles, scoliosis of the spine, and craniofacial asymmetry[1,5,6].This report presents a patient with long-standing strabismus that led to a lifetime of head tilt and secondary cervical/spinal deformities, and illustrates how addressing the visual dysfunction (through neuro-vision therapy) improved her ocular alignment and posture.

Purpose

We aim to describe a case of long-standing ocular misalignment (strabismus) resulting in persistent abnormal head posture with secondary cervical and spinal deformity. This case highlights the importance of identifying ocular torticollis as a cause of “wry neck” and demonstrates that improving visual function can induce positive structural changes in head and body alignment. In other words, restoring binocular visual function may reverse some of the compensatory musculoskeletal adaptations (“function can change structure”).

Patient History

A 31-year-old woman had persistent right head tilt since childhood and underwent torticollis surgery at age six. During adolescence, scoliosis was identified and monitored by orthopaedics before she was discharged as the curvature remained mild and stable. Best-corrected visual acuity was 6/9 in both eyes with anisometropic myopia. Orthoptic assessment revealed large-angle alternating exotropia (30–35 PD near, 25–30 PD distance) with bilateral dissociated vertical deviation and poor convergence. Examination showed constant right head tilt, subtle hemifacial asymmetry and loss of cervical lordosis.

Methods

Single-patient case report with ophthalmic, neuro vision therapy[3,4] and musculoskeletal assessment.

Intervention: The patient enrolled in a neuro-vision therapy[3,4] program for approximately 45 weeks. Neuro-vision therapy (also known as vision therapy or neuro-optometric rehabilitation) is a non-surgical treatment that involves doctor-supervised visual exercises and activities to improve eye alignment, eye movement control, visual–vestibular integration, and binocular function. Her therapy regimen included exercises for smooth pursuit eye movements, saccades, vergence (convergence training), visual-vestibular drills, and postural training while engaging the visual system. The goal was to enhance her binocular coordination and reduce suppression, thereby encouraging more normal ocular alignment and potentially reducing her abnormal head posture.

Result

After completing about 45 weeks of intensive neuro-vision therapy, the patient showed significant improvements in both ocular alignment and head posture. On orthoptic re-evaluation, her strabismus angle had markedly decreased and she achieved measurable stereopsis (depth perception) where previously she had none – she went from no response on stereo testing to 50 seconds of arc on the Randot stereogram test (a level of fine binocular depth perception). This gain in stereoacuity indicates that the patient attained some degree of binocular fusion that was absent before therapy. Corresponding with the improved eye alignment, the patient’s head tilt greatly diminished. Photographs and posture assessment before and after therapy demonstrated a much more level head position and straighter cervical spine. The previously noted hemifacial asymmetry appeared less pronounced, and her overall body posture (shoulder level, spinal alignment) improved. Observers noted that she carried herself with a more normal head position in daily activities without conscious effort. These changes suggest that alleviating the visual conflict (strabismus) reduced her need to maintain a crooked head posture, allowing her neck muscles to relax and her spine to assume a more neutral alignment. The patient also reported reduced neck stiffness and improved comfort. This outcome illustrates that even long-standing postural adaptations due to a vision problem can be partially reversed by treating the underlying visual dysfunction.



Figure 1a



Figure 1b

Figure 1. 9gaze photographs. (a) 9gaze image before the neuro vision therapy. (b) 9 gaze image after neuro vision therapy.



Figure 2(a)



Figure 2(b)

Figure 2 Global posture photographs. (a)Before neuro-vision therapy (b) after neuoro vision therapy

Discussion

This case demonstrates how long-standing undiagnosed strabismus can result in irreversible musculoskeletal sequelae. Our patient developed persistent right head tilt from childhood and later underwent torticollis surgery and orthopaedic follow-up for scoliosis, while the ocular pathology, large-angle alternating exotropia, remained untreated for decades. The chronic compensatory head posture likely led to secondary cervical contracture, hemifacial asymmetry and loss of normal cervical lordosis. Disruption of ocular alignment alters visual–vestibular integration and promotes maladaptive head posture to optimise binocular function.[1,5,6] Coupling between the organ of vision, stomatognathic system and cervical musculature occurs through vestibulo-ocular and cervico-ocular reflexes. Visual impairment has been associated with altered cervical and masticatory muscle activity, supporting a mechanism whereby persistent abnormal gaze leads to sustained muscle shortening and postural remodelling.[2] Failure to recognise ocular causes of torticollis may therefore drive progressive, and eventually fixed, spinal deformity.

Impact of Therapy: Another key lesson from this case is that improving visual function later in life can still confer musculoskeletal benefits. After decades of a habitual head tilt, our patient underwent neuro-vision therapy[3,4] in adulthood, resulting in measurable ocular realignment and even stereo vision recovery. Along with these functional gains, she experienced a noticeable reduction in her abnormal head posture. This suggests that the relationship between vision and posture is plastic to some degree – even in an adult, modifying the visual input (through therapy, optical means, or surgery) can prompt the body to adjust its posture. Vision therapy has been reported to reduce neck muscle strain and abnormal postures in patients with binocular vision disorders. In our patient, the vision therapy likely improved her fusional ability and oculomotor control, thereby diminishing the neural drive to tilt her head for fusion. While her cervical spine may not fully normalize (bony changes in adults are largely permanent), the functional alignment improvement is significant for her quality of life. This finding aligns with the concept that visual rehabilitation can complement orthopedic management in long-standing ocular torticollis cases. A multidisciplinary approach – combining ophthalmologic/neuro vision therapy treatment with musculoskeletal rehabilitation – is ideal for such patients. Neuro-vision therapy[3,4] exercises, prisms, or even strabismus surgery can address the eye misalignment, while physiotherapy can work on stretching and strengthening neck muscles to regain as much normal posture as possible. Our case is unique in that neuro-vision therapy alone (a non-surgical, holistic visual approach) achieved a substantial change in both eye alignment and head posture, underlining the value of neuro-optometric rehabilitation for adult strabismus with torticollis. It provides evidence that improving function (visual/binocular function) can lead to secondary improvements in structure (posture and spine alignment), an encouraging prospect for patients with long-standing ocular torticollis.

Conclusion

Undiagnosed strabismus is an important and frequently overlooked cause of torticollis (abnormal head position). This case reinforces that a “wry neck” in a child is not always due to a primary orthopedic or muscular problem – it can be a clue to an underlying eye misalignment. Delayed identification of the true ocular origin of a head tilt may allow preventable complications to develop, including permanent facial asymmetry and spinal deformities. Ophthalmic and orthoptic evaluation is essential in all patients (especially children) presenting with persistent head tilt or atypical torticollis.

Early intervention (whether via glasses, prisms, vision therapy, or strabismus surgery as appropriate) can correct the ocular misalignment and thereby prevent long-term musculoskeletal disability. Furthermore, even in long-standing cases, treating the visual system can yield improvements: our patient’s outcome shows that neuro-vision therapy[3,4] – a more holistic approach than standard orthoptic exercises – helped realign her eyes and significantly reduced her abnormal head posture. Thus, a collaborative, **multidisciplinary management** including ophthalmologists, orthoptists, behavioural optometrist and orthopedic practitioners offers the best chance of rehabilitating both the visual function and the consequent postural issues in ocular torticollis.

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