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Effect of cervical proprioceptive stabilization and vestibular rehabilitation in cervicogenic vertigo associated with cervical radiculopathy: A case report

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Abstract
Background and purpose: Cervicogenic vertigo is described as a sensation of rotation caused by a change in the upper cervical spine's neck proprioceptive afferents. Patients commonly report a sensation of spinning or falling when turning or flexing and extending their heads as a result of their relationship with the vestibular nucleus. Joint constraints, especially in the C1–C3 motion portions of the upper cervical spine, are frequently noticed.
Case description: Here, we discuss the case of a 26-year-old woman who was identified as having Cervicogenic Vertigo (CV) based on episodes of neck discomfort and vertigo that occurred in tandem. With manual therapy and vertigo exercise, both problems got better.
Outcomes: Neck pain on the Visual Analogue Scale (VAS) reduced from 9–10/10 to 2/10 and the Neck Disability Index (NDI) improved from 25/50 to 10/50, with reduction in the frequency, intensity and duration of vertigo.
Discussion: Because there are no specific tests to demonstrate its etiology, CV is a fairly straightforward complaint for patients, yet it frequently leads to a challenging diagnosis. No patient should be refused a suitable management in order for CV to be taken into consideration.

Keywords: Cervicogenic vertigo, cervical radiculopathy, cervical proprioception, vestibular rehabilitation, manual therapy

Introduction
Vertigo and dizziness are common clinical complaints encountered in musculoskeletal and neurological practice, with a multifactorial etiology involving vestibular, visual, and somatosensory systems. Among the less frequently recognized causes is cervicogenic vertigo (CGV), a condition in which dizziness arises secondary to dysfunction of the cervical spine. Cervicogenic vertigo is characterized by sensations of imbalance, unsteadiness, or disorientation that are temporally associated with neck pain and are typically aggravated by cervical movements or sustained postures.

The cervical spine plays a crucial role in postural control and spatial orientation due to its high density of mechanoreceptors, particularly within the upper cervical joints, deep cervical muscles, and ligamentous structures. These mechanoreceptors provide proprioceptive input that integrates with vestibular and visual information at the level of the brainstem, cerebellum, and cerebral cortex. Disruption of cervical afferent input—commonly seen in conditions such as cervical radiculopathy, spondylosis, disc degeneration, whiplash-associated disorders, and postural dysfunction—can result in a sensory mismatch between cervical proprioceptive, vestibular, and visual systems, leading to dizziness or vertigo.

Cervical radiculopathy is frequently associated with altered cervical biomechanics, muscle spasm, joint hypomobility, and inflammation, all of which may impair cervical sensorimotor control. Dysfunction of the deep cervical flexors and extensors, along with increased joint position error, has been reported in individuals with neck pain and dizziness. This impaired cervical proprioception is considered a key pathophysiological mechanism underlying cervicogenic vertigo. The diagnosis of cervicogenic vertigo remains primarily clinical and is considered a diagnosis of exclusion, requiring careful differentiation from vestibular, neurological, and cardiovascular causes of dizziness. Clinical features supporting the diagnosis include dizziness closely related to neck movement or position, reproduction of symptoms with cervical provocation, improvement of dizziness following treatment of cervical dysfunction, and absence of definitive vestibular pathology. Outcome measures such as the Cervical Joint Position Error (JPE) Test, Neck Disability Index (NDI), and dizziness-specific scales are commonly used to assess functional impairment and treatment effectiveness.

Physiotherapy is widely regarded as a cornerstone in the conservative management of cervicogenic vertigo. Emerging evidence supports the use of cervical proprioceptive retraining, deep cervical muscle activation, postural re-education, and vestibular rehabilitation exercises to restore sensorimotor integration and reduce dizziness. An integrated rehabilitation approach addressing both cervical dysfunction and vestibular adaptation has demonstrated promising results in improving balance, reducing vertigo symptoms, and enhancing functional independence.

This case report aims to highlight the clinical presentation, physiotherapy management, and outcomes of a patient with cervicogenic vertigo associated with cervical radiculopathy, emphasizing the role of cervical proprioceptive stabilization and vestibular rehabilitation in restoring sensorimotor control and functional ability.

Case Desscription

Patient history

A 26-year-old lady, a Dentist Assistant, complained of vertigo during neck movements, mainly while looking upwards, and pain over the nape of the neck. She was having an episodic bout of vertigo that started approximately 2–3 months ago. Her symptoms exacerbated with head motions, mainly rapid extension of the head, head turned to one side and rolling from side to side. The vertigo usually lasted for 10–15 seconds. She had no complaint of hearing loss, tinnitus or ear pain. She also complained of neck pain as well as cervical headache (occasionally), especially in the occiput area, which aggravated in the previous one month, usually increased by evening and was relieved by rest (sleeping).

There was a history of tingling and heaviness in both upper extremities.

No history of trauma. Investigation reports suggested loss of joint space between C2–C3 with fusion of the spinous process (congenital). Bilateral small cervical ribs with soft tissue swelling at the nape of the neck were also noted.

Examination

On examination, forward head posture with rounded shoulders was present. There was spasm over the bilateral trapezius muscle. Tenderness was present over the C1–C2 spinous process, mild on the right side. Continuous dull aching pain was present over the nape of the neck and bilateral trapezius. The Dix-Hallpike test was done to rule out BPPV (benign paroxysmal positional vertigo). On the Visual Analogue Scale, pain was 9–10 before treatment. Her cervical range of motion was restricted due to pain (Table 1, Figure 1).

Table 1: Cervical range of motion before treatment

Cervical movement	Range of motion
Flexion	60°
Extension	35°
Side flexion (RT)	35°
Side flexion (LT)	35°
Rotation (RT)	45°
Rotation (LT)	45°

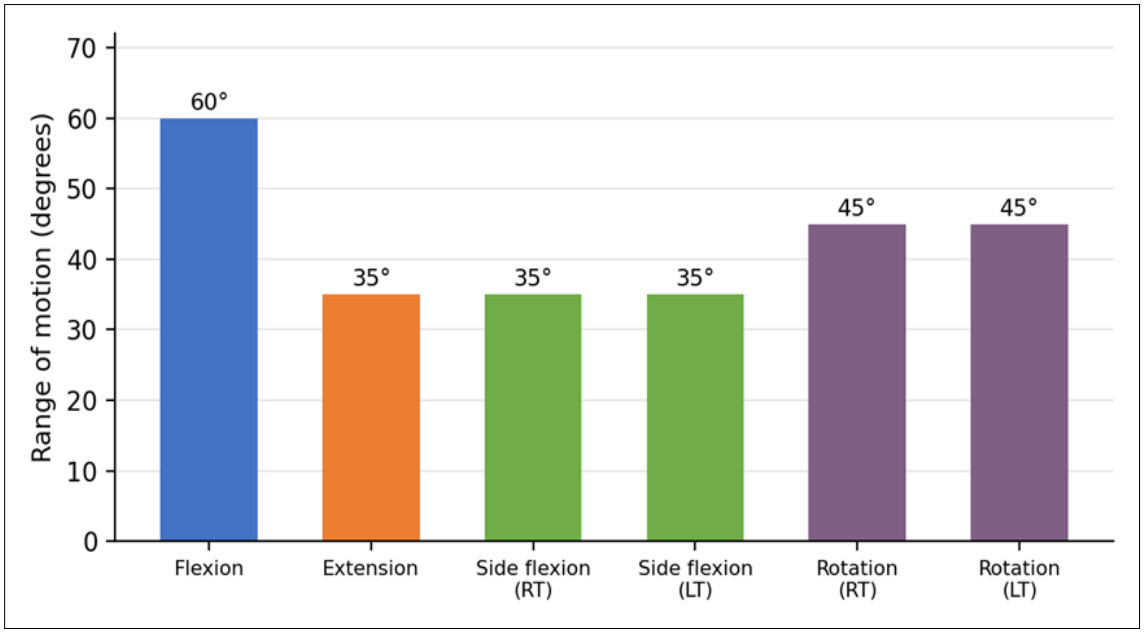


Fig 1: Cervical range of motion by direction before treatment (degrees).

End feel for the cervical region was abnormal tissue stretch. On resisted isometric testing, cervical movements were weak and painful. Hypomobility was noted over atlanto-occipital distraction and lateral glide. Reflex for the upper extremity was normal. Mild horizontal nystagmus was present. Tightness of pectoralis, sternocleidomastoid, levator scapulae and scaleni was present on both sides. Cervical compression, distraction, head neutral body movement test, nerve tension test (median) and Roos's test were positive. Head and trunk rotation and cervical quadrant test were negative. Scoring for the Neck Disability Index (NDI) was 25/50, which indicates severe disability. The Dizziness Handicap Inventory score was 37, which indicates moderate handicap, and the Functional Rating Index for the neck was 50%.

Outcome measures

- **Neck pain:** Visual Analogue Scale (VAS).
- **Neck disability:** Neck Disability Index (NDI, scored out of 50) and Functional Rating Index (FRI) for the neck.
- **Dizziness-related handicap:** Dizziness Handicap Inventory (DHI).
- Cervical range of motion and resisted isometric testing (strength and pain).

Assessments were taken before treatment and after the intervention.

Intervention

The following management was given based on the impairments identified. 3 weeks Intervention with 5 sessions per week.

- **Vertigo:** To relieve cervicogenic vertigo, the exercises prescribed by Revel and co-workers (1994), which have been shown to be effective, were given as shown in Table 2.

- **Cervical spasm and pain:** 4-polar vector 90 IFT was given to the patient for 15 minutes based on literature.

- Placement: two electrodes on the cervical region and two electrodes over the upper back region; frequency 2 kHz, base 20 Hz, spectrum 40 Hz, spectrum mode triangular; duration 10 days.
- According to Shanahan *et al*. (2006), IFT is better as compared to TENS in patients with neck pain.
- Maitland mobilization at C1 and C2 level (PA glide) was given for the cervical spine and facet joint (2–3 oscillations/sec) for 1–2 minutes.
- According to Susan Reid, Darren Rivett *et al*., both manual therapies, including Mulligan and Maitland, have the same effect on reducing dizziness intensity and frequency.

- **Faulty posture:** To correct faulty alignment of posture, chin tuck exercise, scapular retraction and shoulder girdle exercise were given in sitting position (10 repetitions × 3 sets/day).

- **Muscle tightness:** To relieve tightness, stretching of pectoralis major, sternocleidomastoid, levator scapulae and scaleni was given (30 sec hold, 2 repetitions).

- **Muscle performance:** To improve muscle performance of the cervical region, isometric neck and cervical stabilization exercise in the form of craniocervical flexion/axial extension hold for 10 seconds × 10 repetitions was given.

- **Tingling and heaviness:** To reduce tingling and heaviness, neural mobilization for the median nerve was given.

- **Balance:** To improve balance, standing exercises were given as shown in Table 3.

Table 2: Vertigo exercise (Revel *et al*., 1994)

Step	Exercise
1	In supine, passive head movements with eyes fixed on target.
2	Follow moving target usually alternately; slow saccades with free eye and head movements.
3	Then progress to active head movements following a slow-moving target.
4	Active head movements to maintain gaze on a fixed target while the trunk is passively moved.
5	Fixating on target and memorising head positions, then closing the eyes, performing maximum rotation and returning to starting positions, and opening the eyes.

Each exercise was performed 5 times/day for 2 weeks.

Table 3: Standing balance exercises

No.	Exercise	Description
1	Change from sitting to standing and back again	20 times with eyes open. Repeat with eyes closed.
2	Standing with one foot in front of the other	In a corner, practice standing “heel to toe” (one foot in front of the other with the heel of one foot touching the toe of the other foot) with eyes open for 30 seconds. The goal is to stand for the entire 30 seconds without touching the wall. This can be made more challenging by crossing arms across the chest. If this is too hard at first, try standing “almost heel to toe” (with feet touching at big toes and ankles). Once these are mastered with eyes open, practice with eyes closed.
3	Standing on a cushion	In a corner, stand on a couch cushion or several pillows. Try to stand still without touching the wall for 30 seconds. Practice with eyes open. When this is easy, practice with eyes closed. This can be made more challenging by placing feet closer together. Crossing arms across the chest also makes this more challenging. Progress by performing this in the most challenging position possible.
4	Standing and throwing	Throw a small rubber ball from hand to hand above eye level. Throw the ball from hand to hand under one knee.
5	Stand with heels together	Look straight ahead and hold balance (attempt only with assistance).
6	Stand on one foot	Perform first with eyes open, then with eyes closed (attempt only with assistance).

Outcomes

After 2 weeks of treatment, VAS improved from 9 to 2. Her cervical range of motion was full except for terminal restriction noted in all directions. There was also improvement in the NDI score from 25 to 10. On resisted isometric contraction, cervical movements were strong and pain free.

The patient demonstrated significant improvement in symptoms of cervicogenic vertigo, neck pain, and functional disability following a structured 3-week physiotherapy intervention focusing on cervical manual therapy, proprioceptive retraining, postural correction, and vestibular–balance exercises.

Table 4: Outcomes before and after treatment

Measure	Before treatment	After treatment	Change
VAS (0 to 10)	9–10	2	−7 to −8 points
NDI (/50)	25 (severe disability)	10 (mild disability)	−15 (−60%)
DHI	37 (moderate handicap)	Minimal functional impact [30]	-7
FRI for neck (%)	50%	Minimal disability [40%]	10%
Cervical ROM	Restricted due to pain	Near full; minimal terminal restriction, pain free	Improved
Resisted isometric testing	Weak and painful	Strong and pain free	Improved

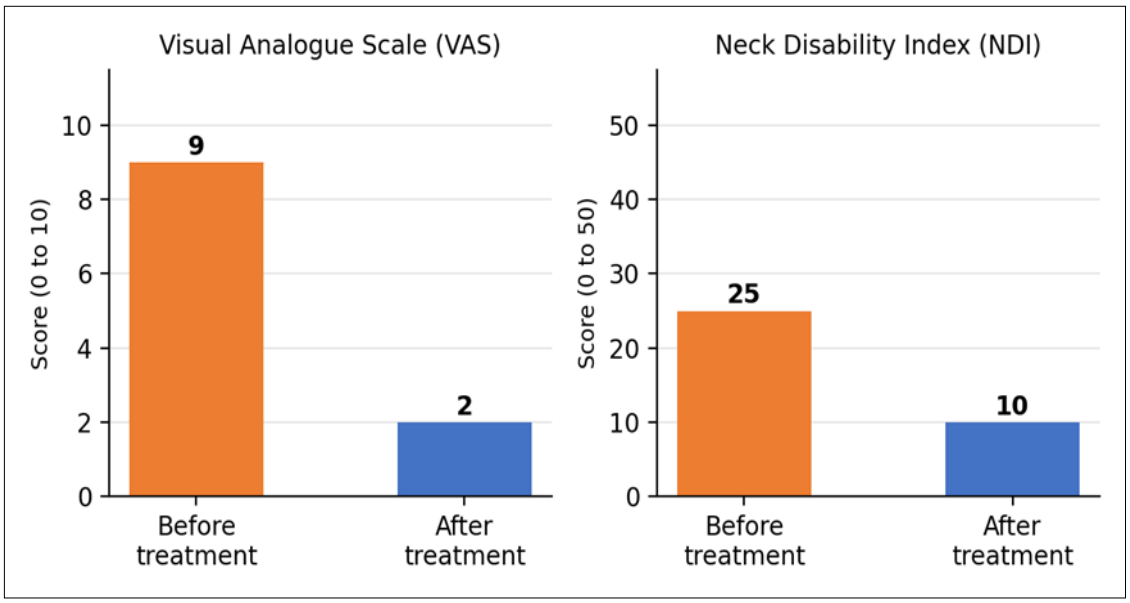


Fig 2: Visual Analogue Scale and Neck Disability Index before and after treatment (VAS 9 plotted from the 9–10 range recorded).

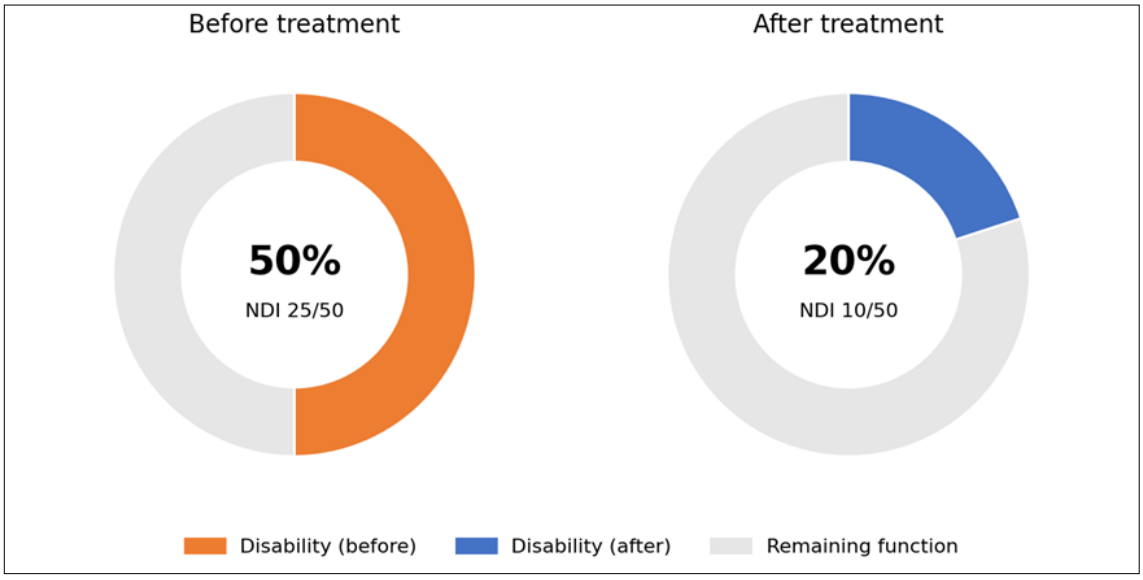


Fig 3: Neck Disability Index expressed as percentage disability (score/50) before and after treatment.

Pain and vertigo

- Visual Analogue Scale (VAS) for neck pain reduced markedly from 9–10/10 pre-treatment to 2/10 post-treatment, indicating substantial pain relief.
- Episodes of vertigo reduced in frequency, intensity, and duration, with no vertigo reported during routine cervical movements by the end of the intervention period.
- Dizziness provoked by cervical extension and rotation was no longer reproducible on clinical testing.

Functional outcome measures

- Neck Disability Index (NDI) score improved from 25/50 (severe disability) to 10/50 (mild disability), reflecting enhanced functional independence in daily activities.
- Dizziness Handicap Inventory (DHI) score improved from 37 (moderate handicap) to a level suggestive of minimal functional impact.
- Functional Rating Index (FRI) for neck improved from 50% disability to a minimal disability level post-intervention.

Cervical range of motion and strength

- Cervical range of motion improved to near full range in all directions, with only minimal terminal restriction and no pain.
- Resisted isometric testing of cervical musculature showed improved strength and pain-free contractions.
- End-feel normalized, suggesting improved joint and soft tissue mobility.

Neuromuscular and postural findings

- Reduction in muscle spasm and tenderness over the upper trapezius, sternocleidomastoid, levator scapulae, and scalene muscles.
- Improved activation and endurance of deep cervical flexor muscles following craniocervical stabilization exercises.
- Noticeable correction in forward head posture and rounded shoulder alignment.

Balance and sensorimotor control

- Improved static and dynamic balance during sit-to-stand activities, tandem stance (heel-to-toe) and standing on unstable surfaces.
- Enhanced postural stability with both eyes open and eyes closed, indicating improved cervical–vestibular sensorimotor integration.

Overall, the patient achieved clinically meaningful improvement across pain, dizziness, function, posture, and balance parameters with conservative physiotherapy management.

Table 5: Timeline (CARE)

Time	Event
2–3 months before presentation	Onset of episodic vertigo (10–15 seconds) provoked by neck movements
Preceding 1 month	Neck pain and occasional cervical headache aggravated
Baseline	Examination, investigations and Dix-Hallpike test; VAS, NDI, DHI and FRI recorded; diagnosis of cervicogenic vertigo associated with cervical radiculopathy
Treatment	Impairment-based physiotherapy: IFT, Maitland mobilization, vertigo exercise, postural correction, stretching, cervical stabilization, neural mobilization and balance exercises
After 2 weeks of treatment	VAS 9 to 2; NDI 25 to 10; cervical range of motion near full; resisted isometric movements strong and pain free

Discussion

Cervicogenic vertigo is a complex clinical entity attributed to altered proprioceptive input from the cervical spine, particularly the upper cervical segments (C1–C3), which have a high density of mechanoreceptors. In the present case, the patient's vertigo was temporally associated with neck pain and cervical movements, supporting the diagnosis of cervicogenic vertigo following exclusion of vestibular causes such as BPPV.

The patient presented with multiple contributing factors including cervical radiculopathy, congenital fusion at the C2–C3 level, cervical rib presence, postural dysfunction, muscle tightness, and upper cervical hypomobility. These impairments are known to disrupt normal cervical afferent input, leading to a sensory mismatch between cervical proprioceptive, vestibular, and visual systems, which is considered the primary mechanism underlying cervicogenic vertigo.

Effect of manual therapy

The significant reduction in pain and dizziness following Maitland mobilization at the C1–C2 level supports existing evidence that manual therapy improves joint mobility, reduces nociceptive input, and normalizes abnormal cervical afferent signaling. Studies by Reid and Rivett have demonstrated that cervical mobilization and manipulation are effective in reducing both the intensity and frequency of dizziness in patients with cervicogenic vertigo. Improved atlanto-occipital and atlanto-axial mobility likely contributed to restoration of normal cervical sensorimotor control in this patient.

Role of electrotherapy

Interferential therapy (IFT) was effective in reducing cervical pain and muscle spasm, thereby facilitating early participation in active rehabilitation. As reported by Shanahan *et al*., IFT has shown superior pain-relieving effects compared to TENS in neck pain, which may explain the rapid reduction in VAS scores observed in this case.

Proprioceptive and stabilization training

Cervical stabilization and craniocervical flexion exercises played a key role in improving deep cervical flexor function. Dysfunction of these muscles is strongly associated with neck pain and dizziness. Improved neuromuscular control of the cervical spine likely enhanced joint position sense and reduced aberrant proprioceptive input to the vestibular nuclei, contributing to symptom resolution.

Postural correction and muscle flexibility

Correction of forward head posture and stretching of shortened muscles such as the pectoralis major, sternocleidomastoid, levator scapulae, and scalenes reduced mechanical stress on the cervical spine. Postural re-education is essential in cervicogenic vertigo, as sustained faulty postures can perpetuate cervical muscle overactivity and joint dysfunction.

Balance and vestibular rehabilitation

The incorporation of balance and gaze-independent postural tasks improved the patient's functional stability and confidence. Balance improvements with eyes closed indicate enhanced reliance on proprioceptive input, suggesting successful recalibration of cervical–vestibular integration. This aligns with evidence supporting combined cervical and vestibular rehabilitation for optimal outcomes in cervicogenic dizziness.

Clinical implications

This case highlights the importance of a multimodal physiotherapy approach addressing cervical joint

dysfunction, muscle imbalance, posture, proprioception, and balance. The marked improvement across outcome measures reinforces the role of physiotherapy as a primary conservative intervention for cervicogenic vertigo.

Conclusion

The findings of this case support the hypothesis that cervicogenic vertigo can be effectively managed through targeted physiotherapy interventions. Early identification of cervical impairments and an integrated treatment strategy can lead to significant improvements in pain, dizziness, functional ability, and quality of life.

Declarations

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References

1. Côté P, Mior SA, Fitz-Ritson D. Cervicogenic vertigo: a report of three cases. Journal of the Canadian Chiropractic Association,1991:35(2):89–94. PMCID: PMC2484651.
2. Chu EC, Zoubi FA, Yang J. Cervicogenic Dizziness Associated with Craniocervical Instability: A Case Report. Journal of Medical Case Reports,2021:12(11):451–454. doi: 10.14740/jmc3792. Epub 2021 Nov 5. PMID: 34804305; PMCID: PMC8577610.
3. Chu ECP, Chin WL, Bhaumik A. Cervicogenic dizziness. Oxford Medical Case Reports,2019:2019(11):476–478. doi: 10.1093/omcr/omz115. PMID: 31844531; PMCID: PMC6902624.
4. Stanton TR, Leake HB, Chalmers KJ, Moseley GL. Evidence of Impaired Proprioception in Chronic, Idiopathic Neck Pain: Systematic Review and Meta-Analysis. Physical Therapy,2016:96(6):876–887. doi: 10.2522/ptj.20150241. Epub 2015 Oct 15. PMID: 26472296; PMCID: PMC4897597.
5. Reid SA, Callister R, Katekar MG, Rivett DA. Effects of cervical spine manual therapy on range of motion, head repositioning, and balance in participants with cervicogenic dizziness: a randomized controlled trial. Archives of Physical Medicine and Rehabilitation,2014:95(9):1603–1612. doi: 10.1016/j.apmr.2014.04.009. Epub 2014 May 2. PMID: 24792139.
6. Magnusson M, Malmström EM. The conundrum of cervicogenic dizziness. Handbook of Clinical Neurology,2016:137:365–369. doi: 10.1016/B978-0-444-63437-5.00026-1. PMID: 27638084.
7. Grigol TA, Silva AM, Ferreira MM, Manso A, Ganança MM, Caovilla HH. Dizziness Handicap Inventory and Visual Vertigo Analog Scale in Vestibular Dysfunction. International Archives of Otorhinolaryngology,2016:20(3):241–243. doi: 10.1055/s-0035-1567808. Epub 2015 Dec 14. PMID: 27413406; PMCID: PMC4942285.
8. Sung YH. Upper cervical spine dysfunction and dizziness. Journal of Exercise Rehabilitation,2020:16(5):385–391. doi: 10.12965/jer.2040612.306. PMID: 33178639; PMCID: PMC7609854.
9. Asavasopon S, Jankoski J, Godges JJ. Clinical diagnosis of vertebrobasilar insufficiency: resident's case problem. Journal of Orthopaedic and Sports Physical Therapy,2005:35(10):645–650. doi: 10.2519/jospt.2005.35.10.645. PMID: 16294985.
10. De Vestel C, Vereeck L, Reid SA, Van Rompaey V, Lemmens J, De Hertogh W. Systematic review and meta-analysis of the therapeutic management of patients with cervicogenic dizziness. Journal of Manual and Manipulative Therapy,2022:30(5):273–283. doi: 10.1080/10669817.2022.2033044. Epub 2022 Apr 6. PMID: 35383538; PMCID: PMC9487935.