



Surgical Outcome of Patients with Cervical Myelopathy Associated with Vertigo

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Abstract

Background: vertigo is a common symptom in cervical spondylitic myelopathy patients as symptoms like neck pain, weakness and sensory affection. Cervical Vertigo (CV) is a symptom with lots of uncertainty around it.

Objectives: To assess the impact of surgical intervention, specifically anterior cervical discectomy as well as fusion, on cases having cervical myelopathy and concurrent vertigo, with a particular focus on its curative effect on the vertigo and other symptoms.

Methods: Among cases having cervical myelopathy that underwent anterior cervical discectomy and fusion (ACDF), we include in this study 30 patients who had associated vertigo and dizziness. Vertigo's presence and characteristics were examined through a specialized questionnaire. All etiological reasons for vertigo that were not cervical in nature had been excluded. We utilize the cervical vertigo evaluation to assess the pre- & post-operative status of vertigo.

Results: A total of 30 cases having cervical myelopathy associated with vertigo underwent ACDF. There is marked improvement in the intensity and frequency of vertigo after surgery. The preoperative CVES score was significantly declined following operation. There is also marvelous improvement in mJOA score and Nurick grade after surgery.

Conclusions: Although cervical myelopathy is associated with an elevated prevalence of vertigo, the etiology of all cases can be attributed to reasons outside the cervical spine. In cases having cervical myelopathy with vertigo in whom other causes of vertigo were excluded, the role of ACDF in treating the vertigo in those patients is very valuable.

Keywords: cervical vertigo, ACDF, cervical myelopathy, cervical vertigo evaluation

146

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Introduction:

Dizziness can be a range of sensations including feeling light, unsteady off- balance or weak, Vertigo is a sensation of rotating motion in adjacent objects, accompanied by the illusion of spinning. It is one of the most prevalent medical complaints, affecting around twenty to thirty percent of people in general [1]. There are a lot of causes that lead to vertigo. Among these causes are is disorders of the inner ear, posterior fossa structures like brain stem and cerebellum and lastly vestibular and psychogenic disorders [2].

Cervical (or cervicogenic) vertigo (CV) is a term that is frequently utilized in clinical practice. However, physicians are unable to provide definitive opinions or clinical guidelines for its diagnosis and management due to a lack of adequate information [3]. Due to the absence of widely accepted clinical or paraclinical tests for CV, the general prevalence of the condition is unknown. Consequently, CV is

primarily diagnosed by exclusion [4].

The causes of vertigo are varied; the most prevalent causes of dizziness & vertigo are inadequate activity of the semicircular canals of the ear, unequal neural activity of the left & right vestibular nuclei in the central nervous system, and blood pressure irregularity as a result of cardiac conditions. There are numerous therapy strategies that were developed with the etiology in mind, and the cases are treated by specialized physicians [5]. Despite the absence of the aforementioned vertigo etiologies, reports exist of a group of patients who has dizziness due to cervical disc degeneration. The concept of cervicogenic vertigo, which is extremely controversial, was introduced to the literature [6], [7].

Cases who have cervicogenic dizziness frequently suffer from neck pain, stiffness, headaches, visual impairment, nausea, & tinnitus. Occasionally, they have psychological symptoms, such as anxiety and



memory and concentration impairments, in addition to physical muscle weakness [8].

In a study conducted by Karlberg et al, fifty percent of the 116 cases diagnosed with cervical spondylosis had dizziness. In 65% of 149 elderly cases over the age of 65, cervical spondylosis was determined by college et al as the reason for dizziness. Cervicogenic dizziness is believed to be associated with degenerative intervertebral discs in cervical spondylosis cases. Although the mechanisms for this relief are not fully understood, it has been demonstrated that patients with this condition who underwent ACDF will experience relief [9].

Patients and Methods

In the period from 2016 to 2020 we operated 30 patients complaining of vertigo, myelopathy, neck pain, clumsy hand, radiculopathy, upper extremities sensory symptoms, abnormal gait and LL weakness are included in our study. All the cases have been operated through ACDF with PEEK cages with autologous bone graft from the excised osteophytes.

Inclusion criteria: Patients with cervical myelopathy due to two, three levels of cervical disc prolapse, C3-C4, C4-C5, C5-C6 with associated vertigo not attributed to any other cause.

Exclusion criteria: any patients with neurological, cardiovascular, otological causes of vertigo and patients with history of head and neck trauma and we also exclude patients with previous neck surgery.

The patients are submitted to complete neurological examination CT and MRI cervical spine, Medical: cardiovascular: auscultation of the heart, palpation of the carotid arteries, B.P. measurement, pulse, Neurological: evaluation of the cranial nerves, tests of coordination or ataxia of the limbs, these include finger nose test, heel knee test ... etc., Neck movement tested and comprehensive ENT examination including.

The history should include such questions as:

- How long the vertigo has been?
- If it is episodic, how long lasts the attack?
- How long the interval between the attacks?
- Are there: tinnitus, diminution of hearing, nausea or vomiting?
- Actual fainting or loss of consciousness.
- Are there special positions of the head or body that excite the dizziness?
- Any associated disease: hypertension,

diabetes, previous cardiac attacks or renal trouble.

- Any drug intake e.g. tranquilizers, hypnotics, ototoxic drugs, ... etc.
- Any improvement of symptoms at last 3 month of conservative treatment.

Investigation

The investigations required depend on the history and examination but usually these include:

1. Audiological test:
 - P.T.A: pure tone audiometry.
 - Speech audiometry.
2. Examination of the vestibular apparatus, simple tests which help in diagnosis of the case.
 - i- The patient is instructed to stand with their feet together, with their eyes open then closed. Positive Romberg's sign when patient is more unsteady when eyes are closed.
 - ii- Walking test: patient asked to walk few meters forwards, then backwards several times, eyes open and eyes closed.
 - iii- Stepping test: the patient is asked to step up and down 50 times in the same spot, with arms stretched out. watch if he deviates to the right or left, also compare the results of the test conducted with the eyes opened and closed. If the patient stays in the same spot or moves forward only slightly during the test, he is normal. If he deviates more than 45o to right or to left, a labyrinthine disorder exists. If he stages so much or almost falls, ataxia of cerebellar origin exists.
 - iv- Gaze nystagmus test: the patient is asked to look at a target e.g. a finger or pencil held directly before him (Plate – 30B). the finger is then moved left and right for 30o and up and down to see if nystagmus occurs.

147

Surgical Techniques

The symptomatic levels were revealed using the standard Smith–Robinson right method. A discectomy was conducted following an adequate exposure and localization of the disc. Additionally, a local decompression was performed by resecting the osteophyte & the posterior longitudinal ligament, if required. Curettage was utilized to extract the cartilage endplates, while the bony endplates were protected. An appropriate-sized cage had been inserted as a standalone device following decompression, containing local decompression bone harvested from the anterior hypertrophic osteophyte



& possible decompression of the posterior border of the vertebral body [10].

Postoperative Management

Rigid cervical collar is commonly utilized postoperative. Cases are advised to remove the device for eating and cleaning (nearly one hour per day), but they are required to wear it for the duration of six weeks. In order to monitor for airway compromise, cases are monitored overnight in the hospital. Diet & physical activity are permissible to the extent that they are tolerable. The case is usually discharged within 48 hours after the operation, and the drain is usually removed on the first postoperative day.

EVALUATION: Clinical findings

The evaluation of cervical myelopathy before & after surgery was conducted using the modified Japanese Orthopedic Association (mJOA) scoring system and the Nurick grade of disability for cervical spondylosis (Table 1). Odom's criteria were used for evaluating the clinical findings. The patients are followed for clinical symptoms like dizziness, vertigo, occipital & neck pain and so on. Patients who underwent surgery and underwent 1 year follow-up visit with comprehensive clinical and radiological evaluations were involved in this research.

Table 1: Nurick grade of disability from cervical spondylosis [14].

Grade	Description
0	Signs or symptoms of root involvement without myelopathy
1	Myelopathy, but no difficulty in walking
2	Slight difficulty in walking, able to work
3	Difficulty in walking but not needing assistance, unable to work full-time
4	Able to walk only with assistance or walker
5	Chairbound or bedridden

Results

The age of patients varied from 41-65 years with an average age of 52.8 ± 7.69 years. We have equal number in both sexes (table 2). The average duration of symptoms before surgery was 7.96 ± 5.42 months (range 2–24 months). As regard symptoms we have 86.7% of patients had neck Pain, 76.7% of patients had Radiculopathy, 90% of patients had upper extremities sensory symptoms, 80% of patients had abnormal gait and 76.7% of patients had LL weakness while all of patients 100% had clumsy Hands, bowel or bladder Symptoms and vertigo. As regard examination we have 20% of patients in studied group had weakness grade 3 in upper limb while 80% of them had weakness grade 4 in upper limb, 20% of

patients had no weakness, 20% had had weakness grade 3 in lower limb and 60% of them had weakness grade 4 in lower limb. 83.3% of patients had Extensor Babinski's sign, and 6.7% of them had Equivocal Babinski's sign, 60% of patients had positive clonus, 40% of patients had signs of dorsal column affection, 43.3% of patients had L'hermit signs. All patients 100% had Exaggerated reflexes and Hoffman's sign. The preoperative assessment of the myelopathy showed that 30% of patients in studied group had nurick grade 1, 30% of patients had nurick grade 2, 26.7% of patients had nurick grade 3, 10% of patients had nurick grade 4 and 3.3% of patients had nurick grade 5. The mJOA score was 11.97 ± 2.2 (Table 3).

148

Table (2): patients characteristic and distribution among studied group.

Studied group N=30	
Age	
mean± SD	52.8 ± 7.69
Sex	
Male	15 (50%)
Female	15 (50%)
Duration of myelopathy (months)	
mean± SD	7.96 ± 5.42

Table (3): patients characteristic and symptoms studied group.



Symptoms	Studied group N=30		
	Preoperative	Postoperative	
		Improvement	Non-improvement
Neck Pain	26 (86.7%)	24	2
Clumsy Hands	30 (100%)	24	6
Bowel or bladder Symptoms	30 (100%)	24	6
Radiculopathy	23 (76.7%)	20	3
Upper extremities sensory symptoms	27 (90%)	22	5
Abnormal gait	24 (80%)	21	3
LL weakness	23 (76.7%)	21	2
Vertigo	30 (100%)	24	6

We have 30 patients with vertigo 24 of them showed marvelous improvement of vertigo post operatively and the remaining 6 patients did not improve and further investigations and close follow up by ENT was done.

Table (4): Grade of Myelopathy distribution among studied group.

Nurick(grade)	Studied group N=30	
	Preoperative	Postoperative
Grade 1	9 (30%)	15
Grade 2	9 (30%)	11
Grade 3	8 (26.7%)	2
Grade 4	3 (10%)	-
Grade 5	1 (3.3%)	2
Modified Japanese Orthopaedic Association (mJOA) score		
Mean ± SD	11.97±2.2	

Clinical and radiologic outcomes

In terms of modified Japanese Orthopedic Association scores & Nurick Grading system. The mJOA score was 11.97±2.2 points prior to operation also, 12.93±2.58 points 1 year after surgery (P=0.126). As regard Nurick Grading score we have 9 patients grade 1 preoperatively elevated to fifteen patients postoperatively. The satisfaction of cases with the surgery was assessed utilizing Odom's criteria. There were 8 patients (27%) had an excellent outcome, 16 patients (53%) had good outcome, four patients (13%) had fair outcome & two patients (7%) had poor outcome (Fig. 1). The solid fusion was established in all cases at 12 months following the operation, and 95% fusion was established at 6 months, as evidenced by radiographs following surgery.



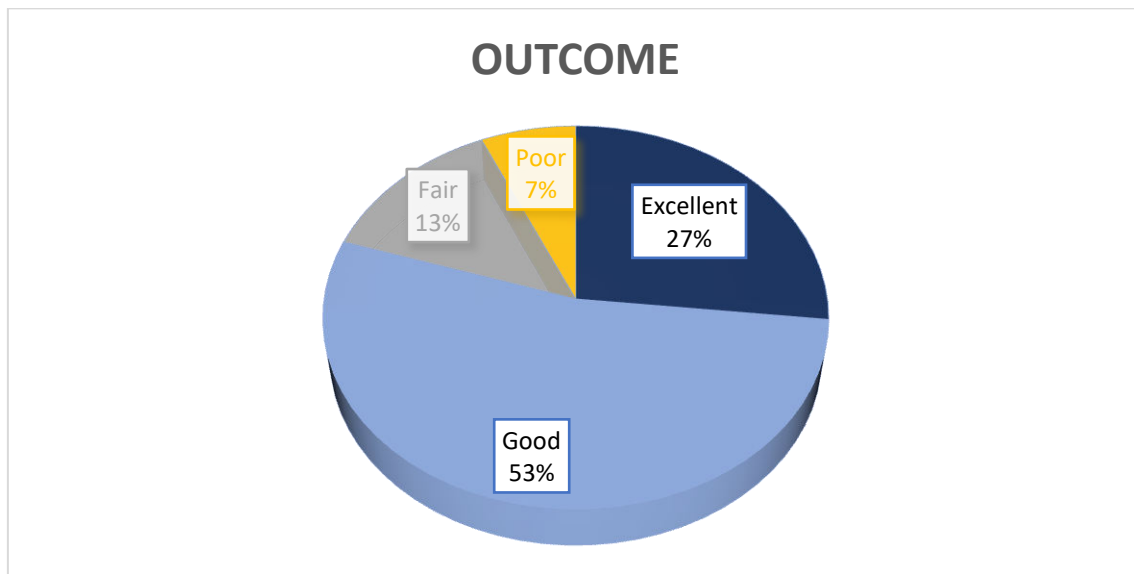


Figure (1): distribution of outcome among studied group.

Case presentation

We present here 3 cases from our study who presented to us with myelopathic symptoms and vertigo. They were submitted to ACDF. They showed postoperative marvelous improvement in their symptoms with improvement of the vertigo and dizziness.

150

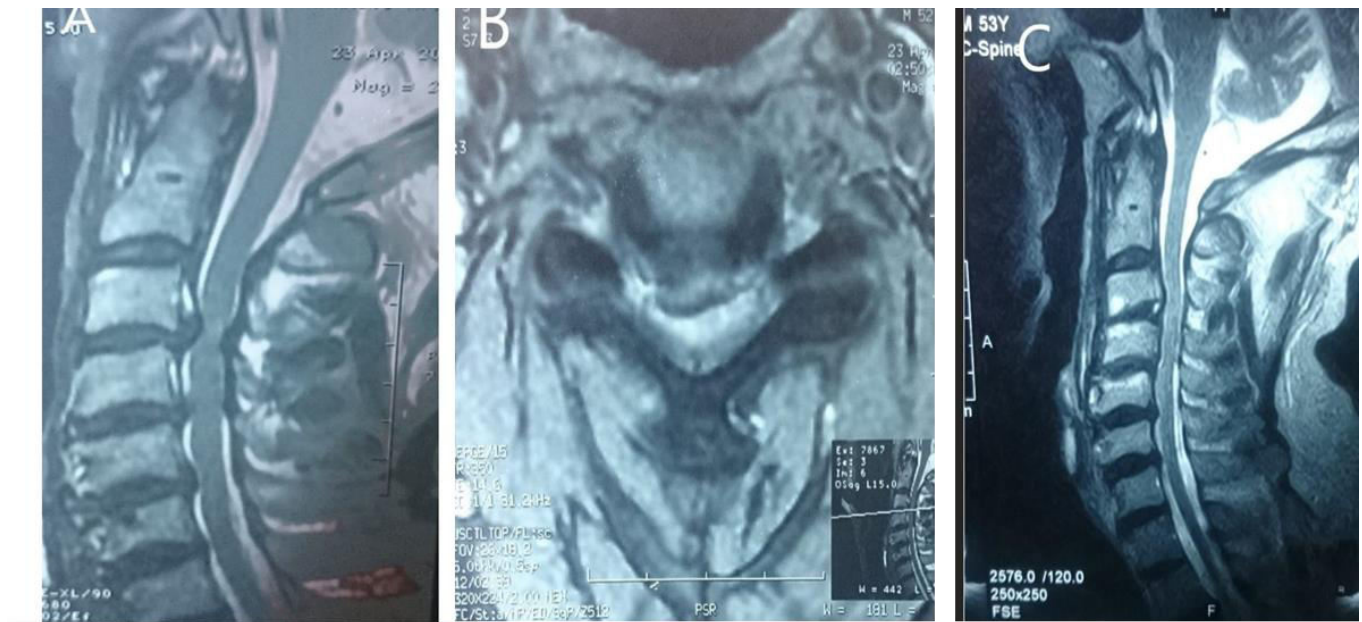


Figure (2):A&B Preoperative MRI cervical spine T2 WI sagittal and axial planes reveals C3-4 central and right paracentral disc herniation obliterating anterior subarachnoid space and compromising ventral aspect of spinal cord kinking it and exhibits foci of T2 intramedullary hyperintense signal impressive of compressive myelopathy. C Post ACDF surgery T2WI sagittal plane reveals almost spinal cord decompression with relative restoration of anterior subarachnoid space.

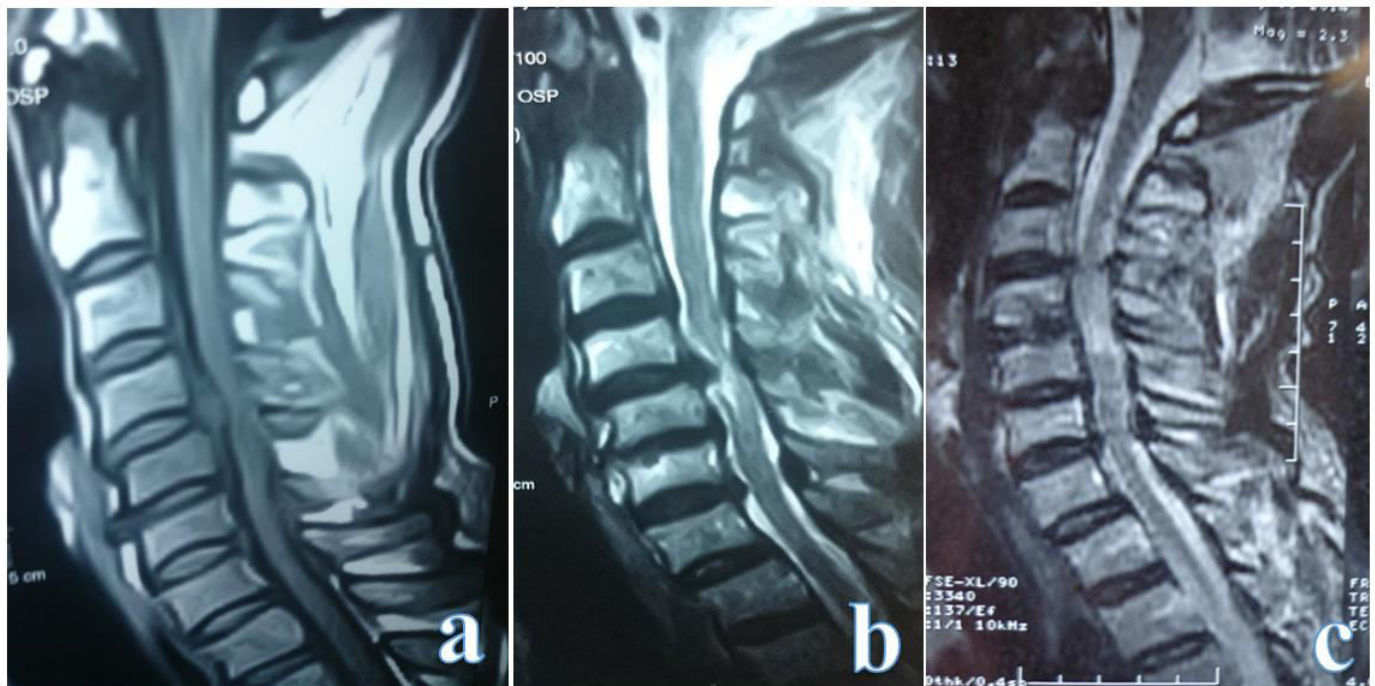


Figure (3) A & B Preoperative MRI cervical spine T1 and T2 sagittal WI reveals C4-5 central disc herniation obliterating anterior subarachnoid space and compromising ventral aspect of spinal cord kinking it with intramedullary hyperintense signal on T2WI impressive of compressive myelopathy. C Post ACDF surgery T2WI sagittal WI reveals almost spinal cord decompression with relative restoration of anterior subarachnoid space.

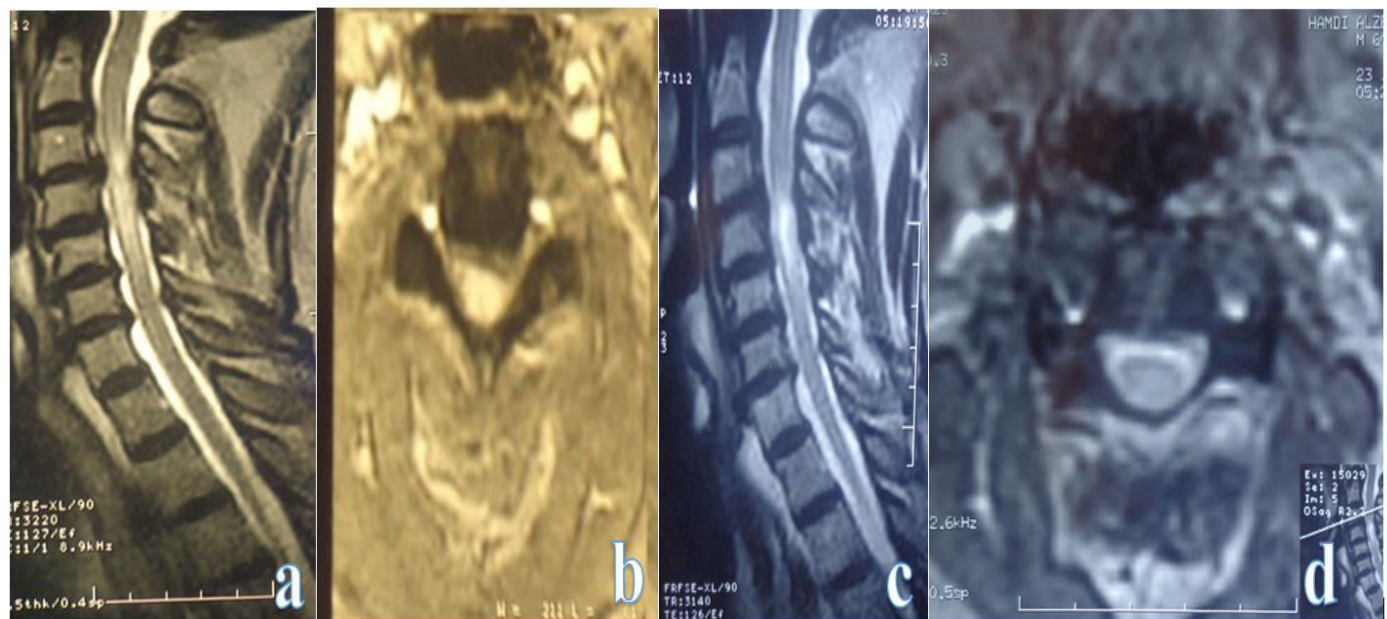


Figure (4) A & B Preoperative MRI cervical spine T2 WI sagittal and axial planes reveals multilevel disc lesions more evident at C3-4 with left postero lateral disc bulge compromising the spinal cord resulted in T2 intramedullary hyperintense signals impressive of compressive myelopathy as well as syrinx. C&D Post ACDF surgery T2WI sagittal and axial planes reveals spinal cord decompression with restoration of anterior subarachnoid space.

DISCUSSION

The patients were operated because the myelopathy not for the vertigo. Therefore, the outcomes shouldn't be interpreted as indicating that all cases with cervical spondylosis and concomitant dizziness must have anterior cervical operation. The objective was to investigate the impact of cervical decompression on the alleviation of dizziness [9]. The etiology of vertigo in cervical myelopathic patients is still unclear. There were many theories that explain the cause of vertigo but no one of them is definite. Ryan and Cope established the term "cervical vertigo" in 1955, suggesting that cervicogenic dizziness was caused by somatosensory input [11]. Another theory is stenosis and rotation of the vertebral artery caused by the degeneration of the cervical discs and canal stenosis. Some authors suggest that this theory is not correct and the diameter of the vertebral artery remained unaltered [12]. There is increased interest

about the role of Ruffini corpuscles in cervical vertigo as proposed by yang et al [13]. The function of Ruffini corpuscles is thought to help in maintaining the muscle tone [14]. According to us of 30 patients with two or three levels cervical myelopathy, the myelopathy time ranged between two months & 24 months. The less the duration of symptoms; the best the outcome. Numerous prior investigations have determined that cases with a duration of symptoms exceeding twelve months are more likely to have an unfavorable outcome compared to those with a shorter duration [15]. Insignificant variances have been observed in symptom duration [16]. There were no significant differences in duration of symptom [17].

In this thesis, the overall outcomes were 8 patients (27%) had an excellent outcome, 16 patients (53%) had good outcome, 4 patients (13%) had fair outcome and 2 patients (7%) has poor outcome. Other series are demonstrated in (Table: 5)

(Table 5): Outcome in other series

Authors (s)	Year	No. of cases	Outcome
Mastronardi et al [18]	2005	36	Excellent (80.5%)
Lin et al [19]	2012	57	Excellent/good/fair/bad : 16/29/9/3
Guyen et al [20]	2016	35	Excellent/good/fair/poor : 12/22/1/0
Yu et al [21]	2014	106 98	Excellent/good/fair/bad 14/39/42/11 (2 level group) 18/36/39/5 (3 levels group)

We found that vertigo did not improve in sex patients in our study. We revised the data of those patients and we reveal that most of those patients are among the older age group of these studies and they are with longer duration of symptoms. There is also degeneration in other cervical levels other than the levels wick already decompressed during surgery. This degenerated level may be the cause of persistent vertigo post operatively as proposed by Peng et al [9]. The literature contains a limited number of studies that address the degenerative disc with surgical intervention for the management of cervical vertigo, with the exception of percutaneous procedures. Li et al [22] presented their cervical spondylosis cases to anterior fusion and documented that almost eighty percent of the vertigo symptoms enhanced.

Conclusion

Although there is a lot of debate about the pathophysiology of cervical vertigo in the literature and role of ACDF in treating myelopathic patients with vertigo, we found that there is improvement of about 80% of those patients with cervical vertigo. The exact role of ACDF in treating those patients is still unclear and further work up is needed to prove its role.

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