

Anterior Cervical Discectomy Using Cage Plate

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Abstract: **Introduction:** Cervical disc degenerative disease is the commonest disorder of the cervical spine. It faces the physiotherapist, orthopaedic surgeon, and neurosurgeon in their daily clinical practice. Soft disc herniations usually affect one level, whereas hard disc herniations can affect multiple levels. Central lesions usually result in cord compression symptoms, and lateral lesions usually result in radicular symptoms. Several terms are commonly used to describe the degenerative cervical spine; the most frequent term is cervical spondylosis, and other synonyms are osteoarthritis, osteoarthrosis, chronic herniated disc, and spur formation. Spondylosis is a term referring to degenerative osteoarthritis of the joints between the centra of the spinal vertebrae and/or neural foraminate. **Objective:** This paper aims to study the anterior Cervical Discectomy Using Cage Plate. **Patients and Methods:** This is a prospective study conducted on 30 patient's candidates for ACDF who were admitted to the orthopaedic department of Basrah University Teaching Hospital, complaining of neck pain, paraesthesia, and numbness in upper limbs and/ or weakness in the lower limbs, during the period from June 2020 till July 2021. All patients were evaluated by detailed history and thorough physical examination with special emphasis on neurological examination and radiological investigations. Detailed history was taken according to a special formula prepared for this purpose; special emphasis was placed upon age, sex, occupation, and regarding neck pain: its site, side, duration, attacks, character, radiation, relieving or aggravating factors, and associated phenomena like neck stiffness or vertigo were recorded too. Neurological symptoms, including numbness, Parasthesia, muscle weakness, and their side, site, distribution, and sphincter disturbances, were asked about. **Results and discussions:** Cervical disc disease, which includes (soft or hard disc protrusion or herniation and degenerative disc disease); is the most common disorder of the cervical spine. Soft disc herniations usually affect one level, whereas hard disc herniations can affect multiple levels (>). Central lesions usually result in cord compression symptoms, and lateral lesions usually result in radicular symptoms. Cervical disc degeneration can be manifested as axial pain, radiculopathy, or myelopathy. The process can be acute, as seen with disc herniations, and cause symptoms resembling those of an acute lumbar disc herniation (i.e., the clear radicular pattern of pain, motor, and sensory deficits); or more indolent from chronic cervical disc degeneration Degenerative problems of the cervical spine generally occur in the middle or later years of life. In our series, the age of patients ranged from 32-70 years with an average of 49.26 years, 86.7% being above 40 yrs, With male to female ratio of 1.7: 1; so our result is similar to what was written by Jan Van Der Bauwhede, Eugene Sherry, (Kelsey, *et al.*, indicated that cervical disc rupture was more common in men by a ratio of 1.4: 1). **Conclusion:** a. High incidence of cervical disc disease in office workers (prolong sitting), housewives and heavy workers (manual worker). b. Lengthy symptom duration was not a negative prognostic marker in our patients. c. Most common abnormal neurological manifestations are a form of radiculomyelopathy, followed by myelopathy. d. Disc space narrowing was the most common abnormality encountered on radiological findings. e. Most affected level was C5-6, followed by C4-5, then C6-7 level and C3-4. f. ACDF with cage plate is an effective treatment for patients with cervical disc disease. g. Patients with MRI show chronic changes of the spinal cord at the affected level (myelomalacia), which signals a poor prognosis of surgery.

Keywords: Cervical disc degenerative disease; ACDF; MRI; and root compression.

INTRODUCTION

Cervical disc degenerative disease is the commonest disorder of the cervical spine. It faces the physiotherapist, orthopaedic surgeon, and neurosurgeon in their daily clinical practice. Soft disc herniations usually affect one level, whereas hard disc herniations can affect multiple levels. Central lesions usually result in cord compression symptoms, and lateral lesions usually result in radicular symptoms. Several terms are commonly used to describe the degenerative cervical spine; the most frequent term is cervical spondylosis, and other synonyms are osteoarthritis, osteoarthrosis,

chronic herniated disc, and spur formation. Spondylosis is a term referring to degenerative osteoarthritis of the joints between the centra of the spinal vertebrae and/or neural foraminate. When the space between two adjacent vertebrae narrows, compression of a nerve root emerging from the spinal cord may result in radiculopathy; less commonly, direct pressure on the spinal cord (typically in the cervical spine) may result in myelopathy if vertebrae of the neck are involved it is labelled cervical spondylosis <2>, and it is referring to common age-related changes in the

area of the spine at the back of the neck. With age, the vertebrae gradually form bone spurs, and their shock-absorbing discs slowly shrink; these changes can alter the alignment and stability of the spine, they may go unnoticed, or they may produce problems related to pressure on the spine and associated nerves and blood vessels. Cervical disc degeneration can be manifested as axial pain, radiculopathy (sensory and motor disturbances, such as severe pain in the neck, shoulder, arm, back, and/or leg accompanied by muscle weakness), or myelopathy (characterized by global weakness, gait dysfunction, loss of balance, and loss of bowel and/or bladder control). The process can be acute, as seen with disc herniations (from a sudden, forceful movement or injury), and cause symptoms resembling those of an acute lumbar disc herniation (clear radicular pattern of pain, motor, and sensory deficits); the clinical picture may also be more indolent from chronic cervical disc degeneration. In an epidemiological study of acute cervical disc prolapse, Kelsey, *et al.*, indicated that (cervical disc rupture was more common in men by a ratio. Factors associated with the injury were frequent heavy lifting on the job, cigarette smoking, and frequent diving from a board. The use of vibrating equipment and time spent in motor vehicles were not positively associated with this problem. Horal reported that 40% of people in Sweden were sometimes affected by neck pain during their lives. Patients with cervical disc disease also are likely to have lumbar disc disease. Kelgren found that 82% of people aged 55 and older have radiographic evidence of cervical degeneration <4>. DePalma reported that in people older than 70 years, 72% had severe radiographic abnormalities <4>. Radiographically, the most frequently involved level is C5-C6, followed by C6-C7 and C4-C5. Upper-level (occiput-C3) involvement is less common. A typical vertebra consists of a rounded body anteriorly and a vertebral arch posteriorly. These enclose a space called the vertebral foramen, through which run the spinal cord and its coverings. The vertebral arch consists of a pair of cylindrical pedicles, which form the sides of the arch, and a pair of flattened laminae, which complete the arch posteriorly. The vertebral arch gives rise to seven processes: one spinous, two transverse, and four articular. The spinous process is directed posteriorly from the junction of the two laminae. The transverse processes are directed laterally from the junction of the laminae and the pedicles. Both the spinous and transverse processes serve as levers and receive attachments

of muscles and ligaments. The articular processes are vertically arranged and consist of two superior and two inferior processes. They arise from the junction of the laminae and the pedicles, and their articular surfaces are covered with hyaline cartilage. The two superior articular processes of one vertebral arch articulate with the two inferior articular processes of the arch above, forming two synovial joints. The pedicles are notched on their upper and lower borders, forming the superior and inferior vertebral notches. On each side, the superior notch of one vertebra and the inferior notch of an adjacent vertebra together forms an intervertebral foramen. These foramina, in an articulated skeleton, serve to transmit the spinal nerves and blood vessels. The anterior and posterior nerve roots of a spinal nerve unite within these foramina with their coverings of Dura to form the segmental spinal nerves.

PATIENTS AND METHODS

This is a prospective study conducted on 30 patients' candidates for ACDF who were admitted to the orthopaedic department of Basrah University Teaching Hospital, complaining of neck pain, paraesthesia, and numbness in upper limbs and/ or weakness in the lower limbs, during the period from June 2020 till July 2021. All patients were evaluated by detailed history and thorough physical examination with special emphasis on neurological examination and radiological investigations. Detailed history was taken according to a special formula prepared for this purpose; special emphasis was placed upon age, sex, occupation, and regarding neck pain: its site, side, duration, attacks, character, radiation, relieving or aggravating factors, and associated phenomena like neck stiffness or vertigo were recorded too. Neurological symptoms, including numbness, Parasthesia, muscle weakness, and their side, site, distribution, and sphincter disturbances, were asked about. History of trauma and its nature were also recorded. Questions about relevant past medical illnesses and past surgical, family, social, and drug history were also included in the formula. Systemic physical examination was performed in all patients. General inspection, vital signs, and watching the patient stance and gait were initially done. Examination of the neck, with the patient, sitting: looking for abnormal posture, increase or decrease in the normal cervical lordosis, localized tenderness in the midline, tender nodule trigger points, and others were done. Active and passive movements of the region were assessed for limitation in range, whether painful or not.

Followed by an examination of both shoulders to exclude rotator cuff lesion, subacromial bursitis, and acromioclavicular osteoarthritis. Which may arise as a differential diagnosis.

Neurological examination was conducted both in the upper and lower limbs, and always a comparison between the left and right sides was made. Tone and power in different muscle groups were assessed. The deep tendon reflexes: biceps, brachioradialis, triceps, knee, and ankle jerk, together with superficial abdominal reflexes (cremasteric and anal reflexes on special occasions), were elicited. Tests for clonus, planter reflex, Hoffman's sign, Lhermitte sign, and axial compression sign were done. Sensory examination was done, including vibration sense, proprioception, sensation to light touch, and pinprick in specific dermatomal distribution were elicited. Examination of peripheral circulation in the upper and lower limbs was done. Rapid assessment of cranial nerves was performed in all patients to exclude higher lesions or multiple sclerosis. Plain x-ray of the cervical spine, both AP and lateral views, was done for all patients, looking for abnormal findings, including loss of normal cervical lordosis, disc space narrowing, traction spurs, osteophytes, the sclerotic margin of vertebral bodies (characteristic of cervical spondylosis), joints subluxation and others. All patients send for MR1 of the cervical region, looking for: disc status (herniated, bulge, sequestered, extruded) and the affected level, cord

compression (anterior or posterior), root compression (right or left), canal stenosis and the affected level, state of the spinal cord(myelomalacia) in addition to state of anterior and posterior longitudinal ligaments. All patients were considered as a candidate for surgical treatment because they were presented either with intractable pain, recurrent attacks of severe pain, who fail to respond to non-surgical treatment options and are significantly affecting the individuals' quality of life and ability to function, or with signs of increased root irritation or progressive myelopathy with motor/gait impairment. The type of surgical treatment was: anterior discectomies with cage plate fixation with adding bone graft (auto-graft from the iliac crest); 3 patients underwent two-level cord decompressions; one level treated with discectomy and cage plate fixation, and the second with discectomy and bone graft fusion. the anterior approach, the right side was chosen to reach the viscerovertebral interval.

RESULTS

A Total of 30 consecutive cases (with clinical and radiological evidence of cervical disc disease treated surgically) were included in this series, 19 men (63.3%) and 11 women (36.7%) with male to female ratio of 1.7: 1; the age of our patients ranged from 32-70 years with an average of 49.26 years, as shown in (Table 1).

Table 1: Age and sex distribution in 30 patients with cervical disc disease

Age (years)	No. of patients	%	Sex			
			Male	%	female	%
31-40	4	13.3	3	10	1	3.3
41-50	10	33.4	7	23.3	3	10
51-60	12	40	5	16.7	7	23.3
61-70	4	13.3	4	13.3	-	-
Total	30	100	19	63.3	11	36.7

Table 2: Duration of symptoms in 30 patients with cervical disc disease

Duration of symptoms	No. of cases	%
6 months - 1 year	3	10
1-2 years	5	16.6
2-5 years	14	46.7
5-10 years	8	26.7

Table 3: Neurological manifestation in 30 patients with cervical disc disease

Neurological manifestation	No. of patient	%	Total
Radiculopathy	3	10	96.7%
Radiculomyelopathy	17	56.7	
Myelopathy	9	30	
Absent*	1	3.3	3.3%

Table 4: Disc space narrowing in 30 patients with cervical disc disease

Level	Disc space narrowing	%
C3-4	3	10
C4-5	8	26.7
C5-6	19	63.3
C6-7	5	16.7
C7-T1	1	3.3

Table 5: Traction spurs in 30 patients with cervical disc disease

Level	Traction spurs	
	No.	Percent
C3-4	2	6.7
C4-5	10	33.3
C5-6	18	60
C6-7	5	16.7
C7-T1	1	3.3

Table 6: Vertebral osteophytes and their locations in 30 patients with cervical disc disease

Level	Osteophytes and their locations			
	Anterior	%	posterior	%
C3-4	4	13.3	2	6.7
C4-5	12	40	10	33.3
C5-6	22	73.3	15	50
C6-7	7	23.3	8	26.7
C7-T1	1	3.3	2	6.7

Table 7: Disc status in 30 patients with cervical disc disease (MRI finding)

Level	Disc status					
	Bulge	%	Herniated	%	extruded	ob
C3-4	1	3.3	2	6.7	-	
C4-5	2	6.7	4	13.3	-	
C5-6	10	33.3	8	26.7	1	3.3
C6-7	3	10	1	3.3	-	
C7-T1	1	3.3	-		-	

Table 8: Cord compressions in 30 patients with cervical disc disease (MRI finding)

Level	Cord compression	%
C3-4	3	10
C4-5	6	20
C5-6	19	63.3
C6-7	5	16.7

Table 9: Root compression and their side in 30 patients with cervical disc disease (MRI finding)

Level	Root compression			
	Right side	%	Left side	%
C3-4	-	-	-	-
C4-5	5	16.7	1	3.3
C5-6	12	40	6	20
	1	3.3	2	6.7

Table 10: Segmental canal stenosis and their levels in 30 patients with cervical disc disease (MRI finding)

Level	Canal stenosis	%
C3-4	3	10
C4-5	4	13.3
C5-6	16	53.3
C6-7	3	10
C7-T1	1	3.3

Table 11: Intraoperative finding in 30 patients with cervical disc disease

Level	Bone osteophyte	Ligament hypertrophy	Disc degeneration	Root canal stenosis
C3-4	2	2	3	-
C4-5	5	2	6	6
C5-6	15	12	18	18
C6-7	4	3	4	3
C7-T1	1	1	1	-

Table 12: No. of cage plate and bone graft used according to the site in 30 patients with cervical disc disease

Level	Cage plate & bone graft	Bone graft only
C3-4	3	-
C4-5	6	-
C5-6	18	-
C6-7	3	2
C7-T1	-	1
Total	30	3

Table 13: The follow-up period and quality of results in 30 patients with cervical disc disease

Follow-up period	Quality of result							
	Excellent		Good		Fair		Poor	
	No.	%	No.	%	No.	%	No.	%
2 weeks	2	6.7	12	40	14	46.7	2	6.7
3 months	2	6.7	13	43.3	12	40	3	10
6 months	2	6.7	13	43.3	12	40	3	10



Fig 1: preoperative radiograph of the cervical spine (case no. 1)



Fig 2: (A, B) Preoperative MRI of the cervical spine (case no. 1) A



B



Fig 3: Ap. & lateral views postoperative radiograph of the cervical spine (case no. I)

DISCUSSION

Cervical disc disease, which includes (soft or hard disc protrusion or herniation and degenerative disc

disease); is the most common disorder of the cervical spine. Soft disc herniations usually affect one level, whereas hard disc herniations can affect

multiple levels (I>. Central lesions usually result in cord compression symptoms, and lateral lesions usually result in radicular symptoms. Cervical disc degeneration can be manifested as axial pain, radiculopathy, or myelopathy. The process can be acute, as seen with disc herniations, and cause symptoms resembling those of an acute lumbar disc herniation (i.e., the clear radicular pattern of pain, motor, and sensory deficits); or more indolent from chronic cervical disc degeneration. Degenerative problems of the cervical spine generally occur in the middle or later years of life. In our series, the age of patients ranged from 32-70 years with an average of 49.26 years, 86.7% being above 40 yrs, With male to female ratio of 1.7: 1; so our result is similar to what was written by Jan Van Der Bauwhede, Eugene Sherry, (Kelsey, *et al.*, indicated that cervical disc rupture was more common in men by a ratio of 1.4: 1). While differ from other recorded literature like; Furman said that displaced cervical discs occur equally as often in men as in women, but cervical spondylosis begins earlier in men, and according to the literature written by Peolsson A, Peolsson M.(male sex is one of potential positive predictive preoperative markers) the high incidence of cervical disc disease in office workers (prolong sitting); its related to the continuous bending of the neck (IS), while in housewives and heavy workers (manual worker) may be related to strains of mobility. So, our results look like the results of Wada, *et al.*, (overuse is an important factor in the pathogenesis of cervical disc disease). Duration of 90% of patients presented with symptoms of more than one-year duration with an average period of 4.1 years. As most of our patients had rather long preoperative symptom duration. So, our result is similar to what was written by Bjarne Lied, Paal Andre Roenning, and Jarle Sundseth (the duration of symptoms failed to influence the final surgery outcome but in contrast with other recorded literature like those written by Nygaard OP, Romner B, Trumpy JH, Bertalanffy H; Eggert HR.(in surgery for lumbar disc degeneration symptom duration months is regarded as a negative prognostic factor which also reported true for ACDF surgery). 27 patients (90%) presented with neck pain, moderate in severity (63%), characterized by heaviness (51.9%), radiated to shoulder(s) in (85.2%), scapular or interscapular regions(70%), aggravated by lifting heavy weight (70%), bending of the neck (55.5%) and homework (40.7%) while in most of them (81.5%); nothing relieves the pain and this is comparable to the finding in many studies as an

indication of surgery. Vertigo and dizziness were associated features in (16.7%), and the headache was in (26.6%). Tamura, *et al.*, noted cranial symptoms such as headache, vertigo, and ocular problems associated with C3-4 root sleeve defects on myelography.

Neck stiffness (56.7 %) related to cervical muscle spasm. Numbness and parasthesia in upper limbs (96.7%) and in lower limbs (76.7%) is due to pressure on the N. root. Weakness in the upper limbs (93.3%) and in the lower limbs (70%). Sphincter disturbances (63.3%), those need a urodynamic study to provide additional information on bladder function, and early dysfunction can be found and followed. Treatment received in form of NSAID (96.6%) and steroids (73.3%) all of them show no benefit which explains the failure of conservative treatment and indication for surgery which is comparable to the finding in textbooks. Associated medical illnesses: hypertension, osteoarthritis of the knee, and chronic backache are disorders which increase in frequency with aging, probably due to wear and tear<25>. Diabetes mellitus (13.3%) because the prevalence of degenerative arthropathies are increased in patients with diabetes mellitus.(IS) Smoking (33.3%): Smoking delays healing by increasing the risk of complications (e.g., infection) and inhibits the bones' ability to fuse; it also decreases blood circulation resulting in slower wound healing and an increased risk of infection<26-27>, while non-smoker status is one of potential positive predictive preoperative markers. <17> Physical examination findings: shuffling gait (60%), which means cervical disc disease is a frequent cause of gait impairment. This may be attributed to both motor and sensory long tracts involvement. Tenderness in the cervical region (73.3%) It's more frequent in acute disc degeneration in addition to the tender nodule and trigger point (23.3%).

CONCLUSION

- High incidence of cervical disc disease in office workers (prolong sitting), housewives, and heavy workers (manual workers).
- Lengthy symptom duration was not a negative prognostic marker in our patients.
- Most common abnormal neurological manifestations are a form of radiculomyelopathy, followed by myelopathy.
- Disc space narrowing was the most common abnormality encountered on radiological findings.

- e. Most affected level was C5-6 followed by C4-5 then C6-7 level and C3-4.
- f. ACDF with cage plate is an effective treatment for patients with cervical disc disease.
- g. Patients with MRI show chronic changes of the spinal cord at the affected level (myelomalacia), which signals a poor prognosis of surgery.

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