

**Original research article****Locking standalone cage and anterior cervical plating with titanium disc cage in degenerative cervical disease comparison of vas scores****<sup>1</sup>Dr. Kiran Tej, <sup>2</sup>Dr. Anuj Manjunath, <sup>3</sup>Dr. Vivekanand Nidoni**<sup>1,2</sup>Spine Fellow, Sanjay Gandhi Institute of Trauma and Orthopedics, Bangalore, Karnataka, India<sup>3</sup>Senior Resident, Sanjay Gandhi Institute of Trauma and Orthopedics, Bangalore, Karnataka, India**Corresponding Author:**

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**Abstract**

Clinical symptoms of cervical radiculopathy include radiating pain and paresthesia along the distribution of a nerve root, often associated with sensory loss and motor dysfunction. Radiculopathy often affects the cervical nerve root segments 4 to 8, resulting in well-recognized clinical syndromes. Patient were divided into two groups as surgeon choice, first group includes 15 patients who had been managed with anterior cervical plate with titanium cage. The second group included 15 patients who had been managed with locking standalone cage. The anterior cervical approach was used. The cartilaginous end plates of the upper and lower end plates were removed after inter body distraction under microscopic view. The removal of the posterior osteophytes was associated with the incision of the posterior longitudinal ligament. The test results demonstrated the mean Visual analogue scores at different time intervals for both the implant groups i.e. locking standalone cage and anterior cervical plate with disc cage groups, the mean VAS scores at pre-op period was  $8.12 \pm 0.99$  for the LSC group and  $7.53 \pm 0.74$  for the APC group. In the post-operative period it was  $4.47 \pm 1.18$  in the LSC group and  $4.07 \pm 0.26$  in the APC group. At 3 months post op, the mean VAS score was  $3.47 \pm 1.19$  in the LSC group and  $4.0 \pm 0.38$  in the APC group, at 6 Months was  $3.20 \pm 1.21$  in the LSC group and  $3.47 \pm 0.52$  in the APC group and at 1 year post op period, it was  $2.87 \pm 1.06$  in the LSC group and  $2.87 \pm 0.52$  in the APC group.

**Keywords:** Cervical disease, vas scores, titanium disc cage**Introduction**

The bony anatomy of the lower cervical spine from C3 to C6 is similar with slight dimensional increases from C3 to C6, but C7 is unique as the transitional vertebra. Posteriorly, spinous processes are bifid from C3 to C6, which are projected inferiorly, and the C7 spinous process is large and not bifid; it often is called the vertebra prominence. A junction exists between the spinous process and lamina, although the transition is less distinct<sup>[1]</sup>.

The normal cervical facet joints have the articular cartilage and menisci that are surrounded by a capsular ligament and lined by a synovial membrane. The joint capsules are innervated richly by proprioceptive and pain receptors that may be important in the pathogenesis of neck pain. There is a definite junction between the lamina and lateral mass, and the lateral edge of the lateral mass forms a ridge down to the transverse process<sup>[2]</sup>.

On the anterolateral aspect, a typical cervical vertebra consists of a body, transverse processes, and pedicles. The body is relatively small and oval, with the medial-lateral diameter greater than the anterior-posterior diameter. From the coronal plane, the superior surface of the vertebral body is concave, and the inferior surface of the body is correspondingly convex. However, from the sagittal plane, the superior surface of the body is slightly convex to or straightly aligned with the corresponding concave inferior surface of the upper vertebral body<sup>[3]</sup>.

Projecting laterally from the cephalic aspect of the vertebral body is the anterior tubercle of the transverse process, which joins the posterior tubercle of the transverse process. The anterior tubercle is a costal element and the C6 anterior tubercle, also known as the carotid tubercle, is a prominent surgical landmark.

Clinical symptoms of cervical radiculopathy include radiating pain and paresthesia along the distribution of a nerve root, often associated with sensory loss and motor dysfunction. Radiculopathy often affects the cervical nerve root segments 4 to 8, resulting in well-recognized clinical syndromes<sup>[4]</sup>.

Each dermatome overlaps widely with adjacent dermatomes, so further evaluation is usually required. Electrophysiological studies and Radiological investigation are used and selective cervical root block is sometimes needed.

**Methodology**

**Study design:** Prospective study.

**Sample size:** 30 cases (15+15).

**Inclusion criteria**

1. Age between 30years and 70 years.
2. Patients having single or double level extruded cervical disc disease with failed conservative management.
3. Patient having cervical disc disease with severe radiculopathy with failed conservative management.
4. Patient having cervical disc disease with severe cervical myelopathy with failed conservative management.
5. Patients willing to give Informed Consent.

**Exclusion criteria**

1. Age less than 30 years and more than 70 years.
2. Medically unfit patients.
3. Patients having more than 3 level cervical disc disease.
4. Patients having OPLL (Ossification of posterior longitudinal ligament).
5. Patients having traumatic cervical injuries.
6. Patients having pathological fractures with cervical radiculopathy or myelopathy.
7. Patients having neurological disorders.

After obtaining written informed consent, inpatient of Department of Orthopaedics fulfilling the inclusion and exclusion criteria. Demographic data, history, clinical examination and details of investigations and interventions will be recorded in the study proforma.

Patient were divided into two groups as surgeon choice, first group includes 15 patients who had been managed with anterior cervical plate with titanium cage. The second group included 15 patients who had been managed with locking standalone cage. The anterior cervical approach was used. The cartilaginous end plates of the upper and lower end plates were removed after inter body distraction under microscopic view the removal of the posterior osteophytes was associated with the incision of the posterior longitudinal ligament. After adequate decompression of two consecutive levels, cages were inserted in the distracted inter vertebral spaces with or without plate under fluoroscopic control. All patients were managed postoperatively with immobilization with cervical collar for 2-3 months.

Patient will be followed post operatively for functional and radiological assessment at 3months, 6months and 12 months.

**Results**

**Table 1:** Visual Analogue Scale Scores

Group Statistics using Friedman’s test						
	Implant	N	Mean	Std. Deviation	Std. Error Mean	P Value
Vas Pre OP	LSC	17	8.12	.993	.241	0.142
	APC	15	7.53	.743	.192	
Vas Post OP	LSC	17	4.47	1.179	.286	0.390
	APC	15	4.07	.258	.067	
Vas 3 Months	LSC	15	3.47	1.187	.307	0.019*
	APC	15	4.00	.378	.098	
Vas 6 Months	LSC	15	3.20	1.207	.312	0.116
	APC	15	3.47	.516	.133	
Vas 1 Year	LSC	15	2.87	1.060	.274	0.567
	APC	15	2.87	.516	.133	

The test results demonstrated the mean Visual analogue scores at different time intervals for both the implant groups i.e. locking standalone cage and anterior cervical plate with disc cage groups, the mean VAS scores at pre-op period was  $8.12 \pm 0.99$  for the LSC group and  $7.53 \pm 0.74$  for the APC group. In the post-operative period it was  $4.47 \pm 1.18$  in the LSC group and  $4.07 \pm 0.26$  in the APC group. At 3 months post op, the mean VAS score was  $3.47 \pm 1.19$  in the LSC group and  $4.0 \pm 0.38$  in the APC group, at 6 Months was  $3.20 \pm 1.21$  in the LSC group and  $3.47 \pm 0.52$  in the APC group and at 1 year post op period, it was  $2.87 \pm 1.06$  in the LSC group and  $2.87 \pm 0.52$  in the APC group.

This difference in the mean VAS scores between different time intervals was statistically significant at  $P < 0.001$  in both the groups. There was significant pain reduction post operatively in both the implant groups and there was no significant difference between the two groups in functional outcome in terms of VAS scores.

**Table 2:** Vas Scores in the 2 Implant Groups in Different Interval

Implant		Vas Pre OP	Vas Post OP	Vas 3 Months	Vas 1 Year
APC	Mean	7.53	4.07	4.00	2.87
	N	15	15	15	15
	Std. Deviation	.743	.258	.378	.516
	Std. Error of Mean	.192	.067	.098	.133
	Minimum	6	4	3	2
	Maximum	9	5	5	4
	Range	3	1	2	2
	Variance	.552	.067	.143	.267
LSC	Mean	8.12	4.47	3.47	2.87
	N	17	17	15	15
	Std. Deviation	.993	1.179	1.187	1.060
	Std. Error of Mean	.241	.286	.307	.274
	Minimum	7	3	2	2
	Maximum	10	8	7	6
	Range	3	5	5	4
	Variance	.985	1.390	1.410	1.124
Total	Mean	7.84	4.28	3.73	2.87
	N	32	32	30	30
	Std. Deviation	.920	.888	.907	.819
	Std. Error of Mean	.163	.157	.166	.150
	Minimum	6	3	2	2
	Maximum	10	8	7	6
	Range	4	5	5	4
	Variance	.846	.789	.823	.671

**Table 3:** Neck Disability Index

Group Statistics using Friedman's test						
NDI	IMPLANT	N	Mean	Std. Deviation	Std. Error Mean	P Value
NDI Pre OP Score	LSC	17	29.88	4.152	1.007	0.024*
	APC	15	26.00	4.408	1.138	
NDI Post OP Score	LSC	17	20.06	3.929	.953	0.064
	APC	15	17.33	3.266	.843	
NDI 3 Month Score	LSC	15	15.53	4.324	1.116	0.461
	APC	15	14.27	3.011	.777	
NDI 6 Month Score	LSC	15	13.07	4.183	1.080	0.486
	APC	15	11.67	2.820	.728	
NDI 1 Year Score	LSC	15	11.40	3.851	.994	0.250
	APC	15	9.60	2.501	.646	

The test results demonstrated the mean neck disability scores at different time intervals for both the implant groups i.e. locking standalone cage and anterior cervical plate with disc cage groups. The mean NDI scores at pre-op period was  $29.88 \pm 4.15$  for LSC group and  $26.00 \pm 4.41$  for APC group. In the post-operative period the mean score was  $20.06 \pm 3.93$  in the LSC group and  $17.33 \pm 3.27$  in the APC group, at 3 months post op was  $15.53 \pm 4.32$  in the LSC group and  $14.27 \pm 3.01$  in the APC group, at 6 Months post op was  $13.07 \pm 4.18$  in the LSC group and  $11.67 \pm 2.82$  in the APC group and at 1 year post op period, it was  $11.40 \pm 3.85$  in the LSC group and  $9.60 \pm 2.50$  in the APC group. This mean Neck disability scores between different time intervals was statistically significant ( $P < 0.001$ ) after using Friedman's test in both the implant groups. In both the LSC and the APC groups, there is a statistically significant improvement in the Neck disability index scores. However, the difference in NDI score improvement between the implant groups was not statistically significant post operatively.

**Table 4:** Overall NDI scores in the study

	N	Mean	Std. Deviation	Std. Error Mean
NDI Pre Op Score	32	28.06	4.642	.821
NDI Post Op Score	32	18.78	3.833	.678
NDI 3 Month Score	30	14.90	3.717	.679
NDI 1 Year Score	30	10.50	3.319	.606

**Table 5:** One-Sample Test for NDI scores

	t	df	P value	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
NDI Pre OP Score	3.732	31	.001*	3.063	1.39	4.74
NDI Post OP Score	-9.178	31	.000*	-6.219	-7.60	-4.84
NDI 3 Month Score	-14.882	29	.000*	-10.100	-11.49	-8.71
NDI 1 Year Score	-23.927	29	.000*	-14.500	-15.74	-13.26

The one sample t test was carried out to assess the NDI scores in the study overall. The test shows a mean pre op NDI score of  $28.06 \pm 4.62$  (severe disability), which reduced significantly to  $18.78 \pm 3.83$  in the post-operative period (moderate disability). The scores further improved significantly to  $14.90 \pm 3.72$  at 3 months post op and  $10.50 \pm 3.32$  at 1 year post op (Mild disability). At each time interval, the improvement in the scores was statistically significant (p value- <0.001).

### Discussion

A study conducted a controlled, multicentric, prospective, randomized study on 20 patients in which 11 were operated with ACD and 9 operated with ACDF with a semi rigid plate and concluded that both achieved satisfactory results but ACDF has the advantage in post-operative period in regards of disc height and neural foramen height [5].

In a study with 242 patients who underwent ACDF, and ACDF with anterior cervical plate in a follow up study of one year concluded that both provided excellent fusion rates patients and is the better modality of treatment for cervical radiculopathy refractory to conservative treatment with ACDFP giving better results than ACDF [6].

A randomized, prospective, multicentric trial to study and compare outcomes of ACD and ACDF, concluded that interbody fusion with disadvantages like higher cost and longer duration of surgery and longer time to return to work is not required in all cases. Accelerated Adjacent Disc Degeneration (AADD) is another well-known complication of ACDF due to increased load and stress at levels adjacent to the fusion site [7].

In this non-randomized prospective single centre outcome study of 258 patients who underwent ACDF for cervical disc degeneration either with tricortical AICG or PEEK cages without additional anterior plating concluded that ACDF with PEEK cages, due to similar clinical outcome and lack of donor site morbidity is preferred to AICG [8,9].

A retrospective review of 50 patients studied long term effectiveness of anterior cervical discectomy and fusion and identified clinical and roentgenographic factors that may increase the chances of recurrent problems. He concluded that Anterior cervical discectomy and fusion yield excellent initial results. However, in a small percentage of patients, the symptoms may recur and be severe enough to require additional surgery [10].

### Conclusion

The difference in the mean VAS scores between different time intervals was statistically significant at  $P < 0.001$  in both the groups. There was significant pain reduction post operatively in both the implant groups and there was no significant difference between the two groups in functional outcome in terms of VAS scores.

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