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Comparison of the Efficacy of Multi Level Cervical Discectomy and Corpectomy Using Titanium Cage with and without Anterior Cervical Plate

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Abstract Cervical corpectomy/discectomy is a well-recognized treatment option for multilevel anterior compression of the cervical spinal cord. We undertook a retrospective study of 47 patients treated with anterior cervical discectomy/corpectomy fusion for multi-level cervical spondylosis. Titanium mesh was placed in all patients with (Anterior cervical plate group: n= 25) or without anterior cervical plate (Non-anterior cervical plate group: n= 22)). The study objective was to compare the role of anterior cervical plate on clinical outcome, fusion rates, and complications if any after anterior cervical discectomy/corpectomy. At an average follow up time of 7 months after the surgery, we did not observe any significant difference in clinical outcome as per Odom's score or bony fusion between the two groups (p>0.05). The bony fusion rate was 59.1% and 68.0% with and without ACP respectively. The finding of this study suggests that presence of anterior cervical plate does not contribute to better Odom's score or bony fusion.

Keywords: *cervical corpectomy, titanium mesh cage, anterior cervical plate, fusion*

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1. Introduction

Reconstruction of the cervical spine after multi level cervical discectomy and corpectomy with titanium cage or carbon spacer is well established. This reconstruction is often combined with anterior cervical plating (ACP) so as to provide immediate stability, increased fusion rates and less need for postoperative rigid immobilization [1,2,3]. However, at our institution we have neurosurgical units that regularly practice placing ACP while others avoid it. We therefore decided to undertake a 5-yearretrospective study to compare clinical outcome, fusion rates, and complications of multiple level anterior cervical reconstructions using titanium cage with and without ACPs.

2. Material & Methods

Following permission by the Hospital Ethical Issues committee to review and use patient data pertaining to surgical procedure and outcome after multi level cervical corpectomy and discectomy, we retrospectively analyzed data of two neurosurgical units. In this analysis we included consecutive patients who underwent a combined multi level anterior cervical discectomy and corpectomy fusion (ACDCF) procedure between 2009-2014 with at least one imaging and clinical assessment between 3-12 months after the procedure. Data fulfilling these criteria yielded 47patients who had multi-level symptomatic degenerative disc disease, disc herniation, or stenosis of the cervical spine with or without myelopathy and/or radiculopathy who underwent multi level ACDCF. All these patients had undergone ACDCF using titanium cage with or without ACP as per unit practice. They were identified as ACP group (n= 22) or non-ACP (NACP) group (n= 25).

Figure 1. showing titanium mesh cages of different lengths

In all these patients, surgery was performed via a transverse surgical incision measuring 3-4 cm made along

a pre-existing skin crease usually on the right side. Fluoroscopy was used in all cases for localization and optimal placement of titanium cage. Corpectomy was performed so as to fit Titanium mesh^{Tm} cage (DePuyAcroMed, DePuy International Ltd, Leeds, England) that had a diameter between 12-15 mm cut to an appropriate length in all patients for the reconstruction of vertebral body (Figure 1). The mesh was packed either with local autograft or bone cement as per surgeon's choice. All patients were advised to wear cervical collar for 4-6 weeks in the post-operative period.

Static (antero-posterior and lateral) cervical spine X-rays were obtained in the operation theatre after performing the procedure and thereafter at least once more between 3-12 months post procedure follow up. Opinion was sought from a radiologist when needed to assess for bony fusion from these images. A patient was presumed to have bony fusion if osseous trabeculae were noted to be bridging across both the rostral and caudal ends of the grafted area. Pseudoarthrosis or "no fusion" was defined when there was lack of trabeculae bridging the graft margins. Cage subsidence was defined as 3mm or more migration of the cage into the adjacent corpectomised vertebral body [1].

Clinical outcome was measured by Odom's criteria [4]. This is given in Table 1. Bony fusion was judged as per radiological finding. Score of 1 was given when fusion was complete while patients with pseudoarthrosis or non-fusion scored 2. Any other observed or stated complication like cage subsidence was also recorded. Attempt was made to correlate between clinical outcome and bony fusion and also whether presence of ACP had any influence on bony fusion and clinical outcome.

Table 1. Odom's criteria

Score	Outcome	Description
1	Excellent	No complaints; able to carry out physical activities
2	Good	Intermittent discomfort, physical activities possible.
3	Satisfactory	Subjective improvement; significant limitation in physical activities.
4	Poor	Worsened or unchanged symptoms and signs.

3. Statistical Analysis

Data was compiled and analyzed using SPSS version 17.0 (IBM, New York). Mann–Whitney rank sum and Chi-Square tests were used to analyze differences in demographic characteristics (age, sex ratio) and in clinical outcome variables between groups (Odom criteria, fusion rates). $P<0.05$ was considered as significant in this retrospective study.

4. Results

A total of 47patients fulfilled the inclusion criteria and were subsequently analyzed. The mean age of the patients in the NACP group was 58.4 ± 10.5 yr (range 37-82 yr) while it was 54. 5 ±13.6 yr (range 24-72 yr) in the ACP group. Like the age, male to female sex ratio was nearly identical in the two groups ($p>0.05$) (Table 2).

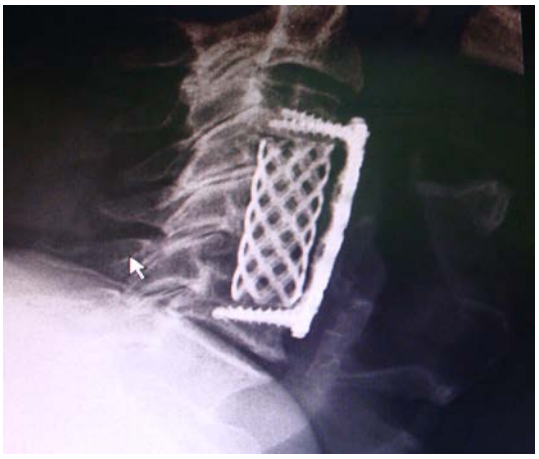

Figure 2. showing 3 level (C3/4, C4/5, C5/6) ACDCF with ACP

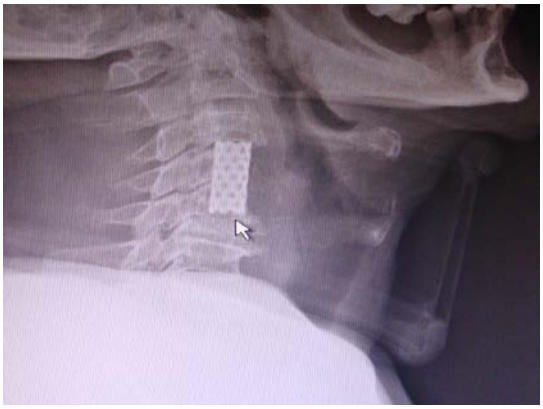

Figure 3. showing 3 level ACDCF (C3/4, C4/5, C5/6) using titanium mesh cage without ACP showing good union with trabeculae formation

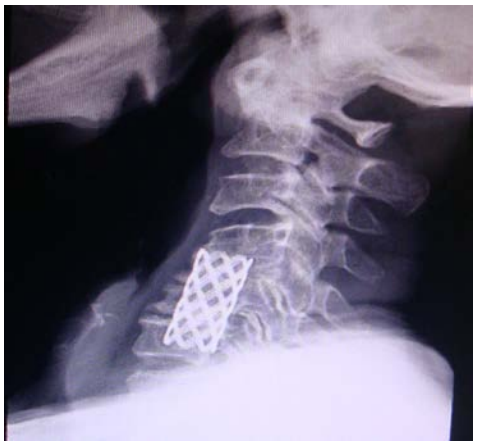

Figure 4. showing 3 level ACDCF (C4/5, C5/6, C6/7) using titanium mesh cage without ACP

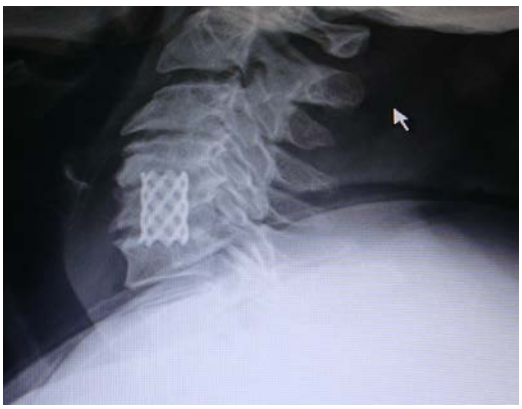

Figure 5. showing 2 level ACDCF (C4/5, C5/6) without ACP

In the five-year period, 2, 3 or 4 level corpectomies were performed in 17, 7, and 1patients in NACP group as compared to 13, 8, and 1 patient in the ACP group respectively (Figure 2 – Figure 5). This difference in distribution was statistically insignificant between the two groups (p>0.05).

Our study revealed that the average clinical and imaging follow up was performed at around 7 months period in either group with an identical range between 3-12 months. There was no significant difference in Odom's score or bony fusion between the two groups (p>0.05) (Table 2) suggesting that presence of ACP does not contribute to better Odom's score or bony fusion.

Table 2. showing the results of demographic data, imaging and clinical outcome in patients of the two groups

Group	Mean Age in Yr (SD)	Sex Ratio M : F in numbers (%)	Mean X-ray follow up period in Months (SD)	Mean Odom's score	Mean Bony Fusion Score
NACP	54.5 (13.6)	14(56%): 11(44%)	7.9 (3.3)	1.5 (0.7)	1.4 (0.6)
ACP	58.4 (10.5)	12(54.5%): 10(45.4%)	7.4 (3.2)	1.6 (0.7)	1.3 (0.5)

M-male, F-female, SD- standard deviation.

The two patients in the NACP group who showed Odom's score of 3 (subjective improvement but with significant limitation in physical activities) did not have proper bony fusion. Similarly, 2 of the 3 patients of the ACP Group with Odom's score of 3 had improper bony fusion. However for patients with Odom's score of 1 or 2, no significant effect of fusion status was noted (p = 0.478).

None of the patients in this series had Odom's score of 4. There was only one 58-year-old female patient who demonstrated cage subsidence and she belonged to the ACP group. She had undergone an uneventful 2 level corpectomy. Her Odom's score was 2 at 8th month of last follow up (Table 3).

Table 3. showing clinical and radiological outcome in the two groups

Group	Odom's clinical outcome score 1 – 4	Number of patients with %	Grade of Bony Fusion (1 or 2) & Cage subsidence	Number of patients with %
NACP	1	15 (60.0%)	1	17 (68.0%)
	2	8 (32.0%)	2	8 (32.0%)
	3	2 (8.0%)	Cage subsidence	0
	4	Nil		
ACP	1	13 (59.1%)	1	13 (59.1%)
	2	6 (27.3%)	2	9 (40.9%)
	3	3 (13.6%)	Cage subsidence	1 (4.5%)
	4	Nil		

There were two patients who underwent 4 levels ACDCF. One of these patients belonged to NACP group. This was a 65-year-old male patient whose discectomy levels ranged from C3/4 to C6/7. Titanium mesh cage with bone cement was used in this patient. When followed up at 4 months period, he had an excellent clinical outcome and perfect bony fusion. The other patient belonged to the ACP group. His ACDCF extended from C4/5 to C7/T1 level. This patient had a satisfactory outcome but continued to have significant limitation in physical activity (Odom's outcome grade 3) when followed up at 7 months period.

Lastly, we did not have any patients with complications like hoarseness of voice, CSF leakage or morbidity till their last follow up.

5. Discussion

The results of this retrospective study demonstrates that presence or absence of ACP following placement of titanium cage in patients undergoing ACDCF does not influence clinical outcome as per Odom's criteria nor bony fusion.

The bony fusion rates have been reported in literature to range between 66.7-97.6% [1,2]. In contrast, the bony fusion rate at our institution following ACDCF was 59.1% and 68.0% with and without ACP respectively. This variation in fusion rates as reported by us in comparison to others may be attributed to the difference in the material used for filling the titanium mesh cage. Our surgeons used either cement or autograft while those reporting the above data had used only autograft. However, use of autograft has its own significant morbidity at the graft site [3]. Our sample size was not large enough to compare the influence of filling material on fusion outcome in the two groups. In general, both bone cement (Polymethylmethacrylate) [5] and autograft [1]fillings have shown acceptable clinical results when using titanium mesh cages. This is in agreement to the findings of this study.

In our study we noted that Odom's clinical score of 3 correlated with non-bony fusion or pseudoarthrosis. For other grades of Odom's scoring, we did not observe any cause and effect relationship with bony fusion status. This is in agreement to others who view that bony fusion is not mandatory for clinical success [5].

Like Panchal et al., [1] we did not use endcaps over the cut edges of titanium cage. This was to achieve better early stabilization and fusion by permitting the cage ends to "bite" into the adjacent vertebral bodies. We encountered only one patient with cage subsidence in our series of 47 patients. This was a patient in the ACP group. Despite the cage subsidence, this 58-year-old female patient had good clinical outcome when followed up at 8 months after the surgery. This is not unusual as partial cage subsidence may actually help fusion [6]. This is in contrast to a higher incidence of cage subsidence in series reported by Gerceket al [7]. It is important to realize that absence of endcaps is one of the known factors for

increased risk for subsidence of the cage. This being a small sample size study, no conclusive inference can be drawn in this regard.

Unlike Panchal et al [1] who had 17.5% patients whose clinical condition deteriorated after the surgery, we did not have any patient of either group who showed deterioration in their clinical condition (Odom's outcome score 4) following ACDCF. This may be an incidental finding attributed to small sample size.

Respiratory difficulty, dysphagia and hoarseness are some of the known complications following this procedure [8]. Fortunately we did not encounter any such complication following ACDCF in our series of 47 patients.

The strengths of this retrospective study include: first, near similar patient demographics in the two groups and second, no bias in patient selection as the two units had their own technique of either using or not using ACP.

This retrospective study had two handicaps. First, we usually had only a single clinical and radiological follow up in the first year after surgery. This was unlike Silber et al (3) who had multiple follow ups regularly at 6 and 12 weeks, 6 months, 1 year, and 2 years. This was mainly because ours is a tertiary hospital with only neurosurgical center in the country with state-of-art facility. Patients are often reluctant to come for follow up to avoid long distance travel especially when they have no major post-operative problem. Second, we did not analyze the influence of autograft versus cement filling on bony fusion, as the small sample size did not justify it. Since the numbers of patients receiving autograft versus cement were evenly distributed in patients with and without ACP, we discounted its influence on bony fusion rates in this retrospective study.

In conclusion, we observed no difference in clinical outcome of patients undergoing ACDCF with or without ACP suggesting that presence of ACP does not contribute to better Odom's score or bony fusion.

References

[1] Panchal RR, Kim KD, Krel MA,Lopez J, Shahaie K, Bobinski M. Using titanium mesh cage and anterior cervical plate for cervical corpectomies. J Spine Neurosurg 2013; 2:4.

[2] Uribe JS, Sangala JR, Duckworth EAM, Vale FL. Comparison between anterior cervical discectomy fusion and cervical corpectomy fusion using titanium cages for reconstruction: analysis of outcome and long-term follow-up. Eur Spine J 2009; 18: 654-662.

[3] Silber JS, Anderson DG, Daffner SD, et al. Donor site morbidity after anterior iliac crest bone harvest for single-level anterior cervical discectomy and fusion. Spine 2003; 28:134-139.

[4] Alperin N, Hushek SG, Lee SH, Sivaramakrishnan A, Lichtor T. MRI study of cerebral blood flow and CSF flow dynamics in an upright posture: the effect of posture on the intracranial compliance and pressure. ActaNeurochir 2005; Suppl 95: 177-181.

[5] Topalovic M, Kroppenstedt S, Cabraja M. The use of polymethy lmethacrylate in cervical spine surgery. Hard Tissue 2013; 2:24.

[6] Schmieder K, Wolzik-Grossmann M, Pechlivanis I, et al. Subsidence of the wing titanium cage after anterior cervical interbody fusion: 2-year follow-up study. J Neurosurg Spine.2006; 4: 447-453.

[7] Gercek E, Arlet V, Delisle J, et al. Subsidence of stand-alone cervical cages in anterior inter body fusion: warning. Eur Spine J 2003; 12: 513-516.

[8] Song KJ, Yoon SJ, Lee KB. Three- and four-level anterior cervical discectomy and fusion with a PEEK cage and plate construct. Eur Spine J 2012; 21: 2492-2497.