ORIGINAL ARTICLE

CLINICAL OUTCOMES OF ANTERIOR CERVICAL DISCECTOMY AND FUSION IN CERVICAL RADICULOPATHY: A PROSPECTIVE ANALYSIS FROM IRFAN GENERAL HOSPITAL IN PESHAWAR

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ABSTRACT

Introduction: Cervical radiculopathy is commonly attributed to compression of nerve roots secondary to a herniated disc or cervical foraminal stenosis due to degeneration of the cervical spine. Surgical techniques most commonly used in cervical radiculopathy are anterior cervical discectomy and fusion (ACDF), posterior cervical foraminotomy (PCF) and cervical disc replacement (CDR). The aim of this study was to evaluate the clinical outcomes of ACDF in cervical radiculopathy in terms of Neck disability index, hospital stay, mortality rate, success rate and complications.

Material & Methods: This prospective study was conducted in Ali Institute of Neurosciences, Irfan General Hospital Peshawar from January 2019 to April 2021. The sampling technique was nonprobability convenience sampling. Patients having diagnosis of cervical radiculopathy through subjective, objective and investigation findings were enrolled in the study. Standard procedure of ACDF was performed after informed consent and outcome measures were assessed post-surgery and after follow-up of eight weeks. Demographic variables such as age, gender, level of surgery and occupation were recorded on a proforma. Neck Pain and Disability scale (NPAD) questionnaire was filled by the participants at eight weeks follow up. Data were analyzed using SPSS version 26.

Results: Data was collected and analyzed of 202 patients as 38 patients did not come for follow ups. Majority of the participants were male 145(72%) while 57(28%) were females. Mean age of the participants were 47 with standard deviation of 3 (Range 31 to 60). When asked about the occupation, 67(33%) were drivers ,81(40%) belonged to labour work while 48(24%) were office workers. Overall the pain and disability scores showed significant improvement as measured by Neck disability index as overall mean score was reported to be 19 post operatively as compared to 45 points pre operatively.

Conclusion: The results of our study concluded that anterior cervical discectomy and fusion is a safe and effective surgical procedure in the treatment of cervical radiculopathy associated with improved patient outcomes and satisfaction. However, the procedure is also associated with complications.

Key Words: Anterior Cervical Discectomy, ACDF, Cervical Radiculopathy

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INTRODUCTION

One of the most common pathology presenting in spinal surgery cases is the Cervical radiculopathy which is characterized by neck pain and numbness radiating to the arm following a dermatomal pattern resulting from nerve root compression and can also be associated with sensory and motor disturbances.[1] It is prevalent among middle aged and elder population with its incidence peaking in fourth and fifth decade of life, while in 70% cases its etiology is commonly attributed to compression of nerve roots secondary to a herniated disc or cervical foraminal stenosis due to degeneration of the cervical spine. Certain risk factors are associated with development of cervical radiculopathy including white race, heavy lifting, cigarette smoking and prolonged postures.[2,3]

The symptoms of Cervical radiculopathy usually improve with time and are responsive to conservative treatment options such as rest, medications and physical therapy, however surgical treatment is preferred if the symptoms do not respond to conservative treatment or if the symptoms progresses causing motor weakness in the extremities.[4] Surgical techniques most commonly used in cervical radiculopathy are anterior cervical discectomy and fusion(ACDF),posterior cervical foraminotomy (PCF) and cervical disc replacement (CDR).[5] The surgical procedure most commonly used is the Anterior cervical discectomy and fusion (ACDF) which was first performed in 1955 by Smith and Robinson and is referred to as the Gold standard surgical procedure for cervical radiculopathy.[6] The incision is made in ACDF through intermuscular plane which reduces the muscle trauma commonly associated with the posterior approach.[7] The pathological disc material is removed, the normal disc height is maintained through intervertebral graft, neural structures are decompressed while plating is done for segmental stabilization.[8] The result of a retrospective study conducted by Jagannathan et al. to evaluate the outcomes of ACDF depicted that even without the use of plating or postoperative orthosis the fusion rate was reported to be 94% while 97% fusion rates were reported by Fraser and colleagues.[7] ACDF is associated with less postoperative pain compared to other techniques due to its muscle sparing approach.[9] However certain complications are also associated with Anterior cervical discectomy and fusion such as CSF leaks, hematoma, dysphagia, recurrent laryngeal nerve palsy, infected wound and respiratory insufficiency.

The aim of this study was to evaluate the clinical outcomes of ACDF in cervical radiculopathy in terms of Neck disability index, hospital stay, mortality rate, complications and success rate.

MATERIAL AND METHODS

This prospective study was conducted in Ali Institute of Neurosciences, Irfan General Hospital Peshawar from January 2019 to April 2021. Ethical approval was granted by the research committee of the Hospital. The sampling technique was non-probability convenience sampling. Patients undergoing Anterior cervical discectomy for cervical radiculopathy were included irrespective of age or gender. Patients having diagnosis of cervical radiculopathy through subjective, objective and investigation findings were enrolled in the study. Patients of cervical myelopathy or undergoing any other procedure were excluded from the study. A total of 240 patients underwent ACDF at the given time period and were part of the study. Standard procedure of ACDF was performed after informed consent and outcome measures were assessed post-surgery and after follow up of eight weeks. Demographic variables such as age, gender, level of surgery and occupation were recorded on a proforma. Neck Pain and Disability scale (NPAD) questionnaire was filled by the participants at eight weeks follow up. Neck disability index consists of 10 domains which measure neck pain, disability and functional limitations along with other factors. Total possible score is from o to 50 which can be characterized as:

0-4points (0-8%) no disability,
5-14points (10 – 28%) mild disability,
15-24points (30-48%) moderate disability,
25-34points (50- 64%) severe disability,
35-50points (70-100%) complete disability

Statistical Analysis:

Data was analyzed using SPSS version 26. Shapirowilk test was used to determine the normality of the data. Descriptive statistics were used to determine frequency and percentages for categorical data while mean and standard deviation were used for numerical data.

Surgical Procedure Steps:

Patient was placed in supine position under general anesthesia with a pillow placed under the shoulder. Neck was padded in slight extension. A collar incision was made 3cm lateral to the mid line at the desired area which was guided through fluoroscope. The plane between sternocleidomastoid muscle and strap muscle was then entered. After that the plane between trachea/esophagus and carotid sheath was entered. The inferior belly of omohyoid was pushed sometimes superiorly and inferiorly or sometimes was cut. After that prevertebral fascia was dissected and disc space was identified. Lumber puncture needle (Pointer) was then placed. After confirmation of the desired level the disc fragment was removed and dissected till the visibility of posterior longitudinal ligament. Cervical retractor was used for vertebral distraction after removal of disc fragment. Posterior longitudinal ligament was also removed till the visibility of internal surface and spinal dura. Laterally the procedure was extended till the joints of lushka. Patency of neural foramina was observed after which Polyaryletherketones (PEEK cage) was used according to the size of the vertebras and were fixed in an oblique direction. After that subcutaneous stiches were made and incision closed. Post op cervical collar was advised for 2 weeks along with antibiotics.

RESULTS

During the time frame, a total of 240 patients underwent ACDF surgery for cervical radiculopathy out of which complete data was collected and analyzed of 202 patients as 38 patients did not came for follow ups. Majority of the participants were males 145(72%) while 57(28%) were females. Mean age of the participants was 47 with standard deviation of 3 (Range 31 to 60). When asked about the occupation, 67(33%) were drivers, 81(40%) belonged from labour work while 48(24%) were office workers. When asked about any previous episodes of neck or arm pain in the previous year, 81(40%) responded with Yes. Majority of patients who underwent ACDF were at the level of C6-C7 91(45%), followed by C5-C6 48(24%),C4-C5 38(19%) while remaining were attributed to other levels or multiple segments. Descriptive statistics are elaborated in Table 1.

The results of our study concluded that overall the pain and disability scores showed significant improvement as measured by Neck disability index as overall mean score was reported to be 19 post operatively as compared to 45 points pre operatively. Individual mean score of all 10 domains on average also showed significant improvement and their score are illustrated in Table 2. Eighty four (84%) patients reported that they were free of the previously occurring radicular pain and sensory symptoms while 95% reported that they can carry out their normal life activities without any discomfort or pain. 152(75%) patients reported at the follow up that they are satisfied with the procedure and its outcomes while 36(18%) percent were unsure while only 14(7%) patients were unsatisfied with the procedure.

Mean hospital stay was 3 days while 96% of Post-operative MRI showed complete resection of the pathological disc material. The success rate of the procedure was 174(86%) according to the Odom's criteria.

Most common complication associated with ACDF in our study was dysphagia 24(12%) followed by post-operative hematoma 10(5%), recurrent laryngeal nerve palsy occurred in 6(3%) of the patients while superficial wound infection was observed in 2(0.8%) of the cases. Mortality rate in our study was 4(2%).

DISCUSSION

Anterior cervical discectomy and fusion (ACDF) has shown success in terms of patient satisfaction and relief of symptoms as evident in earlier studies.[10] Our study demonstrated that ACDF surgery has good clinical outcomes in majority of the patients with cervical radiculopathy. Significant improvement was observed in patient reported outcomes such as neck disability index (NDI) and pain relief.

Several studies are performed to evaluate the clinical outcomes of ACDF, one such retrospective study was carried out in a Danish center for spine surgery, the results of which showed that after follow up of 1 year, the NDI scores were significantly improved as post op NDI values were reported to be 22 .7 points as compared to pre op values (40.0 points).Patient satisfaction was also observed to be higher (65.9%).[11] The results of our study are also consistent with the findings of the retrospective analysis as the post op NDI scores showed significant improvement (19 points) as compared to pre op score (45 points). Patient satisfaction is multifaceted and is not only associated with the clinical outcomes of a

procedure but also with the preoperative status, expectations and other comorbid conditions.

Clinical outcomes used in our study such as NDI and VAS are also reported to be of higher predictors of patient satisfaction in other studies after second and fifth year of follow up.[12] A study carried out by Godil et al reported that Neck disability index followed by Visual analogue scale is the most accurate measure of improvement after surgical management of neck and arm pain.[13] Other outcome measures such as SF12 PCS and EQ-5D are also used to find general health measures and satisfaction.

Although no statistically significant association was found between smoking and developing cervical radiculopathy (p 0.03) but a significant percentage of patients undergoing ACDF were smokers (37.8%). Literature supports the fact that smoking can accelerate the process of disc degeneration which leads to pathologies of disc and consequent neck and arm pain.[14] The results of a study evaluating clinical outcomes of ACDF also reported the frequency of smokers (24.5%) among cervical radiculopathy patient.[15]

Although anterior cervical discectomy showed improved patient outcomes, however certain complications were also reported in our study which were dysphagia (12%), post-operative hamatoma (5%), recurrent laryngeal nerve palsy along with other minor complications. While no hoarseness was reported in our study, it was observe in 1.2% patients in a study carried out to find out surgical complications associated with ACDF which reported dysphagia to be the most frequent complication (3.3%) followed by dural tear (1.3%), superficial wound infection (0.3%).[16]

The most frequent level of cervical spine undergoing ACDF procedures was C6-C7 (45%) followed by C5-C6 (24%). An epidemiological study conducted in Minnesota elaborated that the in patients diagnosed with cervical radiculopathy the most frequent nerve root was C7 followed by C6.The study also reported the annual incidence per 100000 population and was greater in males (107.3) as compared to females (63.5).[17]

As in our study, only those participants were included who had undergone ACDF without a comparator group due to which the efficacy of the procedure cannot be established. This study provided a hypothesis on which future randomized control trial studies need to be carried out in which ACDF as a main surgical procedure should be compared with other established procedures for cervical radiculopathy such as posterior cervical foraminotomy (PCF) and cervical disc replacement (CDR).

CONCLUSION

The results of our study concluded that anterior cervical discectomy and fusion is a safe and effective surgical procedure in the treatment of cervical radiculopathy associated with improved patient outcomes and satisfaction. However, the procedure is also associated with complications.

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Table 1: Demographic variables

Variables		Percentages/Mean and S.D
Gender	Male	145(72%)
	Female	57(28%)
Age	Age of the participants	47 (Range=31 - 60)
Occupation of Patients	Drivers	67(33%)
	Labors	81(40%)
	Office Workers	48(24%)
Smoking	Yes	75(37%)
	No	127(63%)
Previous Episodes of neck or arm pain	Yes	81(40%)
	No	121(60%)
Level of ACDF	C6-C7	91(45%)
	C5-C6	48(24%)
	C4-C5	38(19%)

Table 2: Neck disability index Pre and Post Op scores:

Domains of Neck Disability Index	Pre-Op Mean Values	Post Op Mean Values at Follow up
Pain Intensity	4 ±3.2	2 ±2.7
Personal Care (Washing, Dressing, etc.)	3 ±5.1	1 ±6
Lifting	5 ±5.9	1 ±2.5
Reading	4 ±4.3	2 ±2.2
Headaches	3 ±4.1	1 ±2.7
Concentration	4 ±2.3	2 ±2.9
Work	5 ±6.3	2 ±5.8
Driving	4 ±2.6	1 ±4
Sleeping	4 ±4.9	0 ±3
Recreation	5 ±4.5	2 ±6

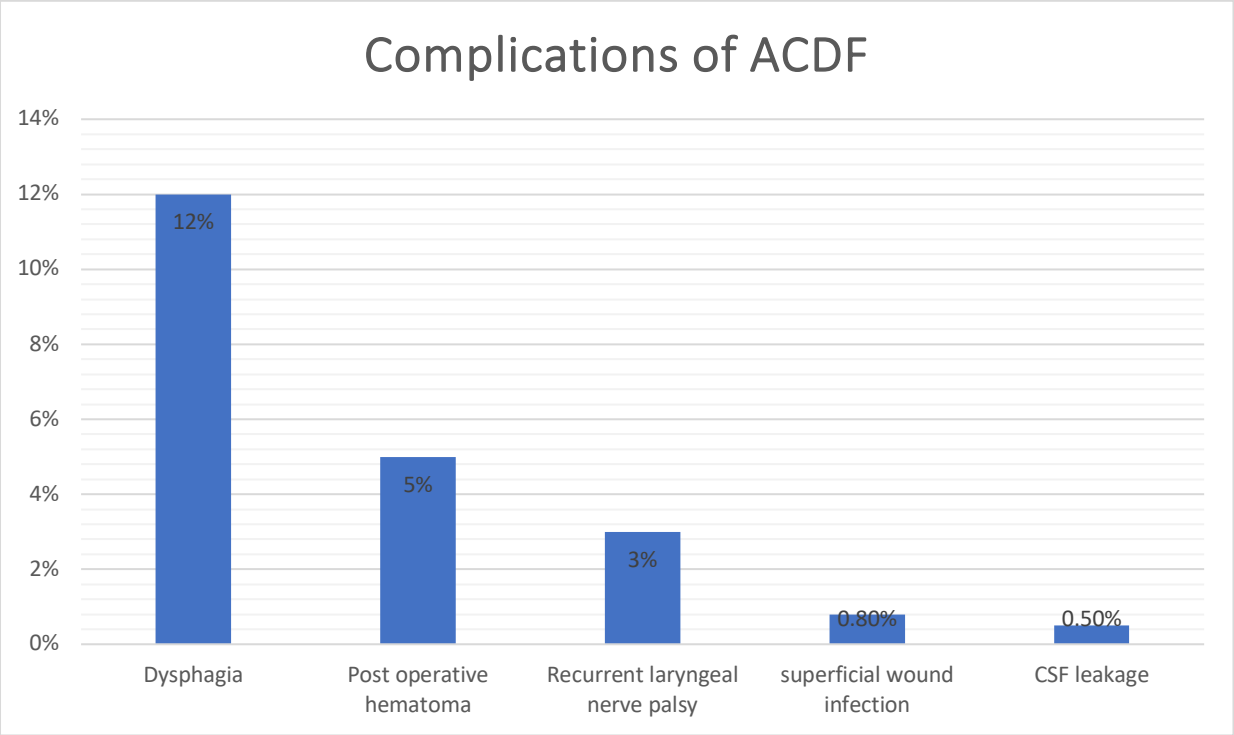

Figure 1: Complications of ACDF