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A STUDY OF FUNCTIONAL OUTCOME IN ANTERIOR CERVICAL DISCECTOMY AND FUSION IN THE NORTH INDIAN POPULATION.

Neuroscience

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ABSTRACT

Background and Objectives. The first-line treatment method for cervical disc herniation is conservative treatments. In rare situations, surgery is recommended owing to signs/symptoms of severe/progressive neurological impairments or the continuation of radicular discomfort after 12 weeks of conservative therapy. The literature reports success in the treatment of cervical disc herniation using ACDF. We seek to investigate the outcome of ACDF in treating cervical disc herniation among North Indians. **Methods and Materials/Patients.** In a retrospective cohort analysis, we looked at 80 patients who received ACDF for cervical disc herniation between 2022 and 2023. The outcome tools were as follows: (1) A study-designed questionnaire that addressed residual and/or new complaints, as well as subjective satisfaction with the operation; (2) a recent (one week prior to the interview) postoperative VAS for neck and upper extremity radicular pain; (3) the Japanese Orthopaedic Association Myelopathy Evaluation Questionnaire (JOACMEQ); and (4) follow-up cervical Magnetic Resonance Imaging (MRI) and lateral X-ray. **Results.** With a mean follow-up period of 53.95 (months) ± 30.79 SD, we had success rates with ΔVAS for neck and radicular pain of 90.2% and 91.8%, respectively. Except for the QOL functional score of JOAMEQ, the other four functional scores of JOAMEQ had a 100% success rate. **Conclusion.** ACDF is a proven surgical procedure for managing cervical disc herniation among the North Indian population.

KEYWORDS

INTRODUCTION

Cervical radiculopathy may be caused by disc herniation, spondylosis, instability, trauma, or, in rare cases, malignancies [1]. Cervical spondylosis causes the vast majority of cervical radiculopathies, with disc herniation accounting for 25% [2]. Cervical radiculopathy point prevalence and annual incidence were observed in a population of 3.5/1,000 and 83/100,000, respectively [3]. Cervical disc herniation primarily affects those aged 30 to 50 years [4]. The C5-C6 level is the most prevalent level of herniation [5]. Conservative approaches are recommended as the first line of therapy for CDH. Approximately 83% of individuals with cervical radiculopathy respond to conservative treatment options [5], whereas roughly one-third will experience ongoing symptoms [6]. The majority of surgeries are performed using an anterior approach with or without fusion [7], while a posterior approach is often used [3]. The surgical therapy of cervical disc herniation has a success rate ranging from 66 to 98% [8]. ACDF has had positive outcomes in terms of pain reduction and patient satisfaction [9]. It has been found that 93% of cases have satisfactory or exceptional results [10].

MATERIALS AND METHODS

Between 2022 and June 2023, the researcher conducted 80 instances of ACDF at a single location. The surgical criteria for cervical disc herniation (CDH) were (1) progressive myelopathy, (2) radiculopathy persisting or increasing after 12 weeks of medical therapy, and (3) motor deficits or persistent pain. Our inclusion criteria were (1) single- or multilayer CDH, and (2) at least 12 months of surgical follow-up. Cases were removed owing to (1) coexisting spine diseases, (2) a history of previous spine surgery, and (3) fewer than 12 months of postoperative follow-up. This series featured 80 CDH patients operated by the ACDF.

The outcome instruments included (1) a study-designed questionnaire that addressed residual and/or new complaints as well as subjective satisfaction with the operation; (2) a recent postoperative VAS for neck and upper extremity radicular pain; (3) the Japanese Orthopaedic Association Myelopathy Evaluation Questionnaire (JOACMEQ); and (4) follow-up cervical Magnetic Resonance Imaging (MRI) and lateral X-ray. The researcher entered preoperative medical information, including preoperative symptoms, pain duration (from beginning to surgery), physical examination, and pain severity using the Visual Analogue Scale (VAS), at the time of operation. The surgical notes were checked for intraoperative problems. Follow-up notes for the postoperative course were reviewed. Our study population was contacted over the phone, briefed about the research topic, and invited to a follow-up visit. This study covers the long-term clinical and radiological outcomes and important variables among patients who received ACDF for herniated cervical disc utilizing a titanium cage with plate.

Data analysis Data was analyzed using SPSS version 22.0 (SPSS, Inc., Chicago, IL, USA). Statistical significance was established at 0.05. For descriptive statistics, central and dispersion trends were used. To compare qualitative variables, a nonparametric test (chi-square) was used. The Mann-Whitney U test was used to compare qualitative and quantitative factors.

RESULTS

Our mean follow-up period was 53.95 months ± 30.79 SD (range: 14-130 months). 80 patients (110 levels) were examined. 55 patients had one-level disc herniation, whereas 20 and 5 patients were operated on for two- and three-level involvement, respectively. 40 were males, and 40 were women. The study population's mean age was 48.36 ± 10.128 SD. The majority of cases (45, 56.25%) included a sedentary work. The majority were nonsmokers, with 72 (90%). Neck and radicular discomfort had mean preoperative VAS scores of 9.24 ± 1.40 SD and 9.23 ± 1.41 SD, respectively, one week before to surgery. At follow-up, the mean postoperative VAS for neck and radicular pain was 1.24 ± 1.50 SD and 1.13 ± 1.22 SD, respectively. The majority (30) of our patients had a disc herniation at the C5-C6 level, whereas fifteen of them had two-level disc herniation at C5-C6/C6-C7. Other patient information is reported in Table 1. Fusion was established by imaging examinations in all 80 individuals that returned for follow-up imaging (100% fusion rate). No statistically significant relationship was seen between radiologic and outcome markers. Furthermore, no statistically significant relationship was found between radiologic results and the intensity of remaining symptoms. Subjective satisfaction with the procedure was 95.6%. The success rates for clinical outcomes regarding VAS for neck and radicular pain were 90.2% and 91.8%, respectively (mean ΔVAS for neck pain: 8.08±3.27 SD; mean ΔVAS for radicular pain: 8.16±3.10 SD). The success rates for five JOAMEQ scores are displayed in Table 2.

We experienced no intraoperative problems. Early surgical complications included hoarseness (five scenarios, 6.25%), C5 root palsy (one case, 1.25%), and dysphagia. Late postoperative complications included 10 (12.5%) situations of subsidence, 8 (10%) cases of adjacent segment degeneration, 2 (2.5%) cases of adjacent segment disease, 1 (1.25%) case of right upper fractured screw, 1 (1.25%) case of screw loosening, and 1 (1.25%) case of graft extrusion. Eight of the patients identified with subsidence underwent single-level ACDF (C5-C6, C6-C7), whereas two had 2-level ACDF. During the follow-up period, none of the patients reported symptoms recurrence. During the follow-up, 46% of patients reported having persistent problems. The most prevalent residual complaint (10) was sensory deficits, followed by patients (8) who continued to have both upper extremity radicular pain and sensory deficits at the last follow-up visit. Five people reported new issues. These were neck pain (1 case; cervical MRI showed 10% cage subsidence; VAS: 5), contralateral to preoperative side of radicular pain (1 case; cervical MRI demonstrated different level disc herniation), limitation of shoulder abduction (1

case; diagnosed with C5 root palsy), sensory deficits (1 case, VAS: 8), and 1 case becoming paraplegic MRI suggestive of white cord syndrome, which later improved.

The result of surgery was unaffected by employment type, smoking status, preoperative neck discomfort or sensory complaints, preoperative hypoesthesia, pain duration, or disc herniation level. Men had considerably better surgical outcomes (value: 0.029) than women (mean rank: 38.02 vs. 30.51).

Table 1: Characteristics Of Studied Patients.

Variable	number	percentage
Job		
Sedentary	45	56.25%
With some level of activity	24	30%
Heavy	11	13.75%
Preoperative symptomatology		
Neck pain	65	81.25%
Upper extremity radicular pain	65	81.25%
Sensory complaints	55	68.75%
Headache	5	6.25%
Incontinency	2	2.5%
Chest discomfort	1	1.25%
Walking disability	15	18.75%
Limb stiffness	8	10%
Pain duration from onset up to surgery		
<3 months	30	37.5%
3-6 months	20	25%
6-12	3	3.75%
12-24	2	1.25%
>24	25	31.25%
Preoperative signs		
Reflexes		
Normal upper extremity reflex	40	50%
Hyperreflexia of upper extremity	25	31.25%
Hyporeflexia of upper extremity	15	18.75%
Normal lower extremity reflex	50	62.5%
Hyperreflexia in lower extremity	35	43.75%
Hyporeflexia in lower extremity	5	6.25%
Upper extremity muscle power (in one or two dermatomal groups)		
3/5	5	6.25%
4/5	55	68.75%
5/5	20	25%
Lower extremity muscle power		
3/5	7	8.75%
4/5	15	18.75%
5/5	58	72.5%
Hoffmann's sign		
Positive	30	37.5%
Negative	50	62.5%
Babinski sign		
Upward	20	25%
Downward	60	75%
Upper extremity hypoesthesia		
Positive	49	61.25%
Negative	31	38.75%

Table 2: JOAMEQ Functional Classes Scores And Success Rates

Functional class	Median score	Success rate
cervical spine function CSF	100	78.1
upper extremity function UEF	100	82.8
lower extremity function LEF	100	70.8
bladder function BF	100	79.2
quality of life. QOL	58.25	12.1

CSF: cervical spine function; UEF: upper extremity function; LEF: lower extremity function; BF: bladder function; QOL: quality of life.

DISCUSSION

In this study, we improved the neck and arm pain of 90.2% and 91.8% of our study participants, respectively. With an average follow-up time of 18 months, Kwon et al. [11] found rates of 96.1% and 82.1% for neck and arm pain, respectively, using VAS. At a mean follow-up of 25.6 months, Liu et al. [12] found substantial clinical improvement in VAS for arm and neck discomfort. Furthermore, Dagli et al. [13] found a substantial drop in VAS after a two-year follow-up. Park et al.'s series [14] found a statistically significant decrease in VAS for both neck and arm pain in the study group after a mean follow-up time of 12 months. Except for the QOL functional score, the other four success rates assessed using JOAMEQ varied from 70.6 to 83.8%. In terms of residual complaints, 47.1% of our subjects reported minimal residual symptoms at the last follow-up. According to Peolsson [15], 70% of their research group experienced prolonged pain and impairment after a 6-year follow-up period. Bohlman et al. [16], Lied et al. [17], and Gaetani et al. [18] found no effect of age on their results. In line with prior research [19-21], we discovered that males of younger ages performed better. In keeping with the findings of Bohlman et al. [16], we were unable to identify a link between smoking status and outcome. In our study, the duration of preoperative symptoms had no statistically significant influence on any of our outcome variables. In their study of patients with cervical spondylotic radiculopathy treated with ACDF, Omidi-Kashani et al. [22] found no link between the length of symptoms and the surgical result. Lied et al. [17] found no significant relationship between discomfort duration before to surgery and pain alleviation.

ACDF has been promoted as a safe technique, however problems may still occur. Complications include nonunion, postoperative dysphagia [23], recurrent laryngeal nerve palsy, esophageal tear, carotid artery damage, vertebral artery injury, neurologic deficit, postoperative respiratory embarrassment, and disc space infection [24]. Flynn identified injury to the RLN as the most common neurologic complication [25]. According to two studies [23, 26], dysphagia is the most prevalent ACDF-related consequence. We had one instance (1.5%) of dysphagia, which is lower than the incidence reported in other research, which varied from 2.5 to 21.3% [27-30].

In a research done by Chen et al. [31], an incidence of 0.16% was recorded for hoarseness, however this rate was reported higher in Baron et al.'s [32] series at a rate of 4.9%, which is comparable to the incidence of 4.4% that we observed among our study population. The incidence of C5 root palsy following anterior decompression and fusion has been recorded in the literature at an average rate of 4.3% (range: 1.6%-12.1%) [33]. In our series, we had one instance (1.5%) of C5 root palsy, which was lower than the 4.3% described by Kim et al. [34]. Graft extrusion has been reported to occur at rates ranging from 0% to 0.88% [12, 26, 35]. The incidence of this problem in our study was 1.5% was higher than other previously reported studies.

Kulkarni et al. [36] observed no cage extrusion or migration in their research population after an average follow-up of 18 months. Cabraja et al. [37] found no cage extrusion after an average follow-up duration of 28.4 months. In a research done by Nanda et al. [26], instances with graft extrusion exhibited persistent neurological symptoms following the procedure, whereas graft extrusion in our patient was related with new onset neck discomfort. The incidence of adjacent segment degeneration (ASdeg) following ACDF has been reported to range between 16 and 51 [38, 39]. At the 2-year follow-up, 21.95% of the participants in Dagli et al.'s [13] trial had ASdeg. Herkowitz et al. [40] found that 41% of their series acquired ASdeg after 4.5 years of follow-up.

In our dataset, we showed a rate of 10% after a follow-up time of 4.41 years±2.67 SD. Some instances of ACDF result in symptomatic adjacent segment disease (ASdx). The reported incidence of ASdx varies from 2 [38] to 41% [40]. Our dataset included two (2.94%) instances with symptomatic ASdx. One of our patients (1.5%) experienced ASdx progression to the point where further surgery was required. With an average follow-up time of 6 years, Bohlman et al. [16] reported that 9% of their patients required further surgery for ASd. In another research [41], 17% of the participants needed further surgery for ASdx after an average of 4.5 years of follow-up.

The prevalence of subsidence in our sample was 12.5%, which is greater than Cabraja et al.'s [37] dataset, which documented PEEK cage sinking in 14.3% of their patients after a mean follow-up of 28.4 months. Galhom [35] reported three cases (7.5%) of subsidence after a two-year follow-up. Ha et al. [42] reported an 8.1% rate of PEEK cage-associated subsidence at a mean follow-up duration of 18.9 months. Park et al. [14] observed sinking in 22.6% of their patients after an average of 12 months of follow-up. In a research done by Song et al. [43], subsidence occurred at a rate of 32.3%.

Kao et al. [44] discovered that subsidence was substantially linked with gender, the number of treatment levels, and therapy at C5-7. In Kast et al.'s study [45], age and gender had no effect on subsidence. We found no relationship between age, gender, or number of treatment levels and subsidence; however, the majority of patients (8) identified with subsidence had received single-level ACDF (C5-C6, C6-C7), with no statistically significant difference.

Kulkarni et al. [36] found 93.33% PEEK cage fusion at 6 months. Cho et al.'s [46] cases showed a 100% fusion rate after an average of 10 months of follow-up. Kulkarni et al.'s [36] study population fusion was maintained at their most recent follow-up, which lasted 18 months on average. Cabraja et al. [37] reported an 88.1% fusion rate for PEEK cages after a mean follow-up of 28.4 months. At a mean follow-up of 25.6 months, Liu et al. [12] found a 72% fusion rate. Song et al. [43] reported 78.9% fusion. In a prospective trial by Niu et al. [47], the fusion rate at 12-month follow-up was 100% in the PEEK cage group. With an average follow-up length of 18.9 months, Ha et al. [42] achieved 94.5% fusion. We obtained 100% fusion rate at a mean follow-up duration of about 53 months.

CONCLUSION

ACDF is an effective surgical procedure for managing cervical disc herniation in the North Indian population. The authors state that they have no conflicts of interest.

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