

Management of cervical monoradiculopathy due to prolapsed intervertebral disc, an institutional experience

ABSTRACT

Background: Cervical radiculopathy is the common clinical entity, often caused by “wear and tear” changes that occur in the spine. In the younger population, cervical radiculopathy is a result of a disc herniation or an acute injury causing foraminal impingement of an exiting nerve, whereas in the older individuals, it is due to foraminal narrowing from osteophyte formation, decreased disc height, and degenerative changes of the uncovertebral joints anteriorly and of the facet joints posteriorly. In most (75%–90%), cervical radiculopathy responds well to conservative treatment, whereas the remaining patients, who fail to achieve acceptable recovery with conservative modalities, alone need surgical decompression of the nerve root. Surgical interventions can be categorized into anterior and posterior approaches to the spine. Our study is focused on the surgical outcome of anterior discectomy with fusion versus posterior cervical discectomy with foraminotomy for cervical monoradiculopathy.

Materials and Methods: Ours is a retrospective study including patients of one level unilateral posterolateral cervical disc prolapse with radiculopathy operated in Department of Neurosurgery, Bangalore Medical College and Research Institute between 2012 and June 2016. The hospital records, imagings, operation notes, and follow-up records were reviewed and analyzed. One hundred and fourteen patients of cervical monoradiculopathy were investigated and operated, 76 operated by anterior cervical discectomy with fusion (ACDF), and 38 operated by posterior cervical laminoforaminotomy (PCL).

Results: The average operation time in 76 patients of ACDF group was 178 min and in 38 patients of PCL group was 72 min. Sixty-nine (91%) patients of ACDF and 38 (100%) patients of PCL had symptomatic relief but statistically ($P > 0.5$) was not significant. Three patients in ACDF group had hoarseness of voice due to recurrent laryngeal nerve palsy and there were no fresh permanent neurological deficits in any patients of PCL group over a follow-up period of 36 months. The average postoperative hospital stay was 5 days in ACDF group and 3 days in PCL group. The average intraoperative blood loss was <50 ml in ACDF group and 650 ml in PCL group. The need of analgesic for pain arising from bone graft site in ACDF group was comparable with operative site pain in PCL group.

Conclusions: PCL is a simple approach, yields gratifying results, and is a promising alternative in selected cases of cervical monoradiculopathy due to disc prolapse.

Keywords: Anterior cervical discectomy and fusion, cervical monoradiculopathy, posterior cervical laminoforaminotomy


INTRODUCTION

Cervical radiculopathy affects 85 out of 100,000 people and is the result of nerve being irritated as it leaves the spinal canal. It is characterized by radiating pain from the neck to the area of body supplied by corresponding nerve root [Table 1]. Weakness and lack of coordination in the arm and hand can also occur. Disc herniation accounts for 20%–25% of the cases of cervical radiculopathy. In the older patients, cervical radiculopathy is often a result of foraminal narrowing

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Table 1: Patterns of nerve root compression syndromes

Nerve root	Pain pattern	Weakness	Reflexes
C2	Occipital, eyes		
C3	Neck, trapezius		
C4	Neck, trapezius		
C5	Shoulder, lateral upper extremity	Deltoid	
C6	Lateral forearm, first two digits	Biceps	Biceps absent
C7	Posterior forearm, third digit	Triceps	Triceps absent
C8	Medical forearm, fourth and fifth digit	Finger abduction, grip	

from osteophyte formation, decreased disc height, and degenerative changes of the uncovertebral joints anteriorly and of the facet joints posteriorly. Factors associated with increased risk include heavy manual labor requiring the lifting of more than 25 pounds, smoking, and driving or operating vibrating equipment.

The patient’s history and clinical examination alone can diagnose cervical radiculopathy in over 75% of cases.^[1] The most common symptom associated with radiculopathy is arm pain or paresthesia in the dermatomal distribution of the affected nerve. Magnetic resonance imaging (MRI) scan is the investigation of choice. No exact criteria have been defined that obviate the patient to a particular course of treatment. The majority of patients diagnosed with cervical radiculopathy (75%–90%) will improve with nonoperative management.^[2,3] When patients fail nonoperative management or otherwise meet inclusion criteria for surgery, there are multiple options available for the operative intervention of cervical radiculopathy. General practice deems that patients with clinically significant motor deficits, debilitating pain that is resistant to conservative modalities and/or time, or instability in the setting of disabling radiculopathy are indications for surgery. In addition, urgent surgery is indicated in a subset of patients. Patients who have an acute profound neurologic deficit with obvious pathology generally require surgery in an urgent manner. Spinal alignment, stability, balance, and surgeon’s preferred technique, all play a role in the decision of which operation to perform.^[4] Surgical interventions can be narrowed down into two large categories: anterior and posterior approaches to the spine.

Anterior cervical discectomy and fusion (ACDF) using Smith–Robinson approach affords the ability to restore cervical lordosis, predictably decompresses the nerve root by indirectly increasing disk height with bone graft in intervertebral space leading to neural foraminal widening, and use of anterior plating implants which preserves position of the graft, thereby increasing the fusion rates. Complications

of anterior surgery include persistent swallowing problems and recurrent laryngeal nerve injury (1%), especially when approached from right side. Moreover, operative pain at the bone graft harvesting site.

Posterior cervical laminoforaminotomy (PCL) is performed by exposing the junction of the lamina and facet joint at the affected level. A high-speed burr is then used to open a window in the lamina and remove the medial one-third of the facet joint, thus exposing the affected nerve. If necessary, the nerve can be carefully and gently retracted to expose and remove a fragment of herniated disc. The posterior operation has the benefit of maintaining spinal alignment and not requiring a fusion. This, theoretically, prevents the breakdown of the adjacent level. The primary complication with this procedure is neck pain, presumably secondary to muscle dissection.^[5] Certain risk factors such as advanced age, cervical kyphosis, and previous surgery may predispose patients to progressive degeneration and spinal deformity.^[6] One of the most important limitations to the posterior surgery is the amount of bony decompression that can safely be achieved. Since this procedure does not allow for indirect decompression through distraction, the nerve must be directly decompressed. If there is a large amount of bony foraminal stenosis, this may not be possible without destabilization of the facet and the need for a fusion.^[7] Therefore, this technique may be best applied to soft disc fragments causing neural foraminal stenosis.

MATERIALS AND METHODS

Ours is a retrospective study of 114 patients of one level unilateral posterolateral cervical disc prolapse with radiculopathy operated in Department of neurosurgery, Bangalore Medical College and Research Institute between 2012 and June 2016. The hospital records, imagings, operation notes, and postoperative follow-up records were reviewed and analyzed. We operated upon 114 patients with unilateral cervical monoradiculopathy, aged between 31 and 59 years, 80 were men and 34 were women. Of the 114 patients operated, 94 had failed to respond to conservative modalities alone and 20 had disabling radiculopathy with clinically significant neurological deficits necessitating early surgical decompression. All patients had preoperative MRI scan of cervical spine, which showed unilateral intervertebral disc prolapse at [Table 2] C6–C7 level in 73 (64%) patients, C5–C6 level in 26 (23%), C4–C5 level in 8 (7%), C7–T1 level in 5, (4%) and C3–C4 level in two patients.

Surgical approach

The approach was decided by operating surgeon based on patient’s age, radiological features exhibiting cervical spine

curvature, and extent of disc prolapse with or without bony foraminal stenosis due to osteophytes. Seventy-six patients were operated by anterior cervical discectomy with autologous iliac crest bone graft and ACDF and 38 patients were operated by PCL.

ACDF was done under X-ray C-arm guidance to localize the level of surgery, using Smith–Robinson approach from right side of neck in all cases, and autologous iliac crest bone graft was harvested and anterior cervical plating was done. The intervertebral space was distracted in all patients with spreader and posterior longitudinal ligament was sharply dissected and any extruded disc fragment was removed with the help of nerve hook. Average duration of operation was 178 min and 69 (91.8%) patients had pain relief. Three patients developed hoarseness due to recurrent laryngeal nerve palsy. Throat pain and difficulty in swallowing were seen in most of the patients which decreased over time. However, pain at bone graft harvesting site was the one which was most troubling for all patients.

PCL was done under X-ray C-arm guidance, through posterior vertical midline skin incision over the neck with unilateral subperiosteal muscle dissection followed by laminoforaminotomy using electronic microdrill and laminotomy was done extending laterally up to junction of lamina and facet and microscopic discectomy done. There is always profuse venous bleed due to opening of epidural venous plexuses. The average intraoperative blood loss was 650 ml and postoperative blood transfusion was necessary in eight patients. We had intraoperative cerebrospinal fluid (CSF) leak due to nerve root dural rupture in 12 cases, where it was not possible to achieve primary suturing and local muscle patch was used. Two patients had postoperative

suture site CSF leak and needed re-exploration and fascia lata and tissue plasminogen activator glue for patching the defect. All (38; 100%) patients of PCL had relief of radicular pain. Three patients had sensory loss corresponding to nerve root retracted due to neuropraxia, which later recovered. The average duration of operation was 72 min.

RESULTS

The average operation time [Table 3] in 76 patients of ACDF group was 178 min and in 38 patients of PCL group was 72 min. Sixty-nine (91%) patients of ACDF and 38 (100%) patients PCL had symptomatic relief but statistically ($P > 0.5$) was not significant. Three patients of ACDF had hoarseness of voice due to recurrent laryngeal nerve palsy and there was no fresh permanent neurological deficits in any patients of PCL over a follow period of 36 months. The average hospital stay was 5 days in ACDF group and 3 days in PCL group. The average intraoperative blood loss was <50 ml in ACDF group and 650 ml in PCL group. The need of analgesic for pain arising from bone graft site in ACDF group was comparable with operative site pain in PCL group.

DISCUSSION

Operations for cervical disc herniation are some of the most gratifying operations done by neurosurgeons. The posterior approach was started by Spurling and Scoville in 1944^[8] and the procedure was refined by Scoville to the keyhole facetectomy.^[9] The anterior operation was begun in 1955 by Robinson and Smith^[10] and a variation on the anterior approach was done by Cloward^[11] 3 years later. Many series of such anterior operations have been published, and all authors have noted gratifying results and over the ensuing years the popularity of the anterior operation, with or without fusion, has greatly increased. Instrumentation further increased the popularity of anterior discectomy as the fusion procedure became simplified.

The proponents of ACDF, Korinith *et al.*, in 2006 studied 293 patients comparing anterior and posterior procedures for soft disc herniations and found superiority with the anterior technique.^[12] Herkowitz *et al.*^[13] compared the efficacy of ACDF with PCL in 33 patients. This group was then followed

Table 2: Level of unilateral cervical disc prolapse and the approach used at each level

Intervertebral level	Patients (%)	Approach	
		ACDF	PCL
C3-C4	2	2	0
C4-C5	8 (7)	8	0
C5-C6	26 (23)	22	4
C6-C7	73 (64)	44	29
C7-T1	5 (4)	0	5
Total	114	76	38

ACDF - Anterior cervical discectomy and fusion; PCL - Posterior cervical laminoforaminotomy

Table 3: Surgical outcome in 114 patients of cervical monoradiculopathies operated

Approach	n	Average operative time (min)	Relief of pain (%)	Residual deficits	Pain at operative site (%)	Pain at bone graft site (%)	Recurrent laryngeal palsy	Postoperative CSF leak	Hospital stay after operation (days)
ACDF	76	178	69 (91)	0	0	68 (90)	3	0	5
PCL	38	72	38 (100)	0	29 (76)	0	0	2	3

ACDF - Anterior cervical discectomy and fusion; PCL - Posterior cervical laminoforaminotomy; CSF - Cerebrospinal fluid

for a mean of 4.2 years. The authors alternated procedures on a comparable patient population and found that 95% of the patients in the ACDF group had positive outcomes, while 75% of the posterior surgery group had positive outcomes. The difference was not statistically significant and therefore showed that both anterior and posterior procedures for cervical radiculopathy have excellent efficacy when indicated correctly.

The proponents of PCL, Dohrmann and Hsieh^[14] analyzed the long-term outcomes of anterior versus posterior approaches for cervical disc herniation in 6000 patients, of which 2888 (48.1%) had anterior operations (anterior cervical discectomies, with or without fusion) and 3112 (51.9%) patients were operated on posteriorly (laminoforaminotomies/“keyhole” facetectomies). Although initially equal, in long-term follow-up, patients who had anterior operations had 80% good/excellent results, whereas patients with the posterior approach had 94% good/excellent results. The difference was significant ($P < 0.05$). The probable explanations for such a difference may be that the posterior operation visualizes the cervical nerve root more completely; however, good visualization of the nerve root is obtained with the anterior operation as well; therefore, another explanation may be that the nerve root in the foramen is decompressed over a greater distance. Perhaps the extensive opening of the bony foramen, converting it from a bony “tunnel” into a bony “trough,” decreased the possibility of nerve root compression from future disc material or future compression from osteophytic growth, narrowing the foramen.

In our series, the surgical approach was decided by operating surgeon based on patients age, level of the disc space affected, curvature of the spine. Patients of any age with disc prolapse at C4–C5 and above were all operated by ACDF, younger patients with C5–C6 level and below with soft sequestered disc were preferably operated by PCL. The operative time in ACDF was definitely longer than the PCL group [Table 3]. The average postoperative hospital stay in PCL group was shorter than ACDF group, inspite of higher intraoperative blood loss and eight patients needing blood transfusion. The reason for longer stay in ACDF group was throat pain and difficulty in swallowing in most of the patients. The pain of bone graft harvest site in ACDF group was comparable to the pain of muscle dissection of PCL group. Reexploration for postoperative CSF leak was necessary in two patients of PCL group. Three patients in ACDF group had hoarseness due to unilateral recurrent nerve

palsy and there was no deficits in PCL group over a follow-up period of 36 months.

CONCLUSIONS

PCL is a simple approach, yields gratifying results and is a promising alternative in selected cases of cervical monoradiculopathy due to disc prolapse.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Wainner RS, Gill H. Diagnosis and nonoperative management of cervical radiculopathy. *J Orthop Sports Phys Ther* 2000;30:728-44.
2. Radhakrishnan K, Litchy WJ, O’Fallon WM, Kurland LT. Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990. *Brain* 1994;117(Pt 2):325-35.
3. Sampath P, Bendebba M, Davis JD, Ducker T. Outcome in patients with cervical radiculopathy. Prospective, multicenter study with independent clinical review. *Spine (Phila Pa 1976)* 1999;24:591-7.
4. Fessler RG, Sekhar LN. Atlas of Neurosurgical Techniques: Spine and Peripheral Nerves. New York: Thieme; 2006.
5. Witzmann A, Hejazi N, Krasznai L. Posterior cervical foraminotomy. A follow-up study of 67 surgically treated patients with compressive radiculopathy. *Neurosurg Rev* 2000;23:213-7.
6. Jagannathan J, Sherman JH, Szabo T, Shaffrey CI, Jane JA. The posterior cervical foraminotomy in the treatment of cervical disc/osteophyte disease: A single-surgeon experience with a minimum of 5 years’ clinical and radiographic follow-up. *J Neurosurg Spine* 2009;10:347-56.
7. Grieve JP, Kitchen ND, Moore AJ, Marsh HT. Results of posterior cervical foraminotomy for treatment of cervical spondylitic radiculopathy. *Br J Neurosurg* 2000;14:40-3.
8. Spurling RG, Scoville WB. Lateral rupture of the cervical intervertebral discs. A common cause of shoulder and arm pain. *Surg Gynecol Obstet* 1944;78:350-8.
9. Scoville WB, Dohrmann GJ, Corkill G. Late results of cervical disc surgery. *J Neurosurg* 1976;45:203-10.
10. Robinson RA, Smith GW. Antero-lateral disc removal and interbody fusion for cervical disc syndrome. *Bull Johns Hopkins Hosp* 1955;96:223-4.
11. Cloward RB. The anterior approach for removal of ruptured cervical disks. *J Neurosurg* 1958;15:602-17.
12. Korinath MC, Krüger A, Oertel MF, Gilsbach JM. Posterior foraminotomy or anterior discectomy with polymethyl methacrylate interbody stabilization for cervical soft disc disease: Results in 292 patients with monoradiculopathy. *Spine (Phila Pa 1976)* 2006;31:1207-14.
13. Herkowitz HN, Kurz LT, Overholt DP. Surgical management of cervical soft disc herniation. A comparison between the anterior and posterior approach. *Spine (Phila Pa 1976)* 1990;15:1026-30.
14. Dohrmann GJ, Hsieh JC. Long-term results of anterior versus posterior operations for herniated cervical discs: Analysis of 6,000 patients. *Med Princ Pract* 2014;23:70-3.