

Long-Term Results of Anterior versus Posterior Operations for Herniated Cervical Discs: Analysis of 6,000 Patients

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Key Words

Cervical disc herniation · Cervical disc operations · Anterior cervical discectomy/fusion · Posterior cervical disc operations · Laminoforaminotomy · Keyhole facetectomy

Abstract

Objective: To analyze the long-term outcomes of anterior versus posterior approaches for cervical disc herniation. **Methods:** The records of 6,000 patients who had operations for cervical disc herniation (radiating arm pain and/or motor symptoms involving the upper extremity) and who had been followed for at least 2 years (mean: 7.1 years) were culled from the world literature and included in this analysis. The outcome (good/excellent, according to the patient) of anterior versus posterior surgery was compared. **Results:** Of the 6,000 patients, 2,888 (48.1%) had anterior operations (anterior cervical discectomies, with or without fusion) and 3,112 (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 ($p < 0.05$). **Conclusion:** The better long-term results with the posterior operation might be due to the more complete opening of the foramen for neural decompression at the time of the operation and thereafter.

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Introduction

Operations for cervical disc herniation have been done for decades [1–35]. The posterior approach was started by Spurling and Scoville in 1944 [22]. The anterior operation was begun in 1955 by Robinson and Smith [29] and a variation on the anterior approach was done by Cloward [3] 3 years later. Both operations were successful at relieving patients of radiating arm pain and motor and/or sensory symptoms. Most surgeons did either the anterior or the posterior approach and a few surgeons performed both operations. All surgeons reported that these operations were quite successful. There has not been a large study comparing the long-term results of anterior versus posterior operations. This study assessed long-term follow-up in patients operated anteriorly as well as those patients having posterior procedures.

Subjects and Methods

The records of 6,000 patients who had been operated upon for cervical disc herniation (radiating arm pain and sensory and/or motor symptoms involving the upper extremity) were culled from the world literature [1–35]. To be included in this study, the patients had to have been followed for 2 years or more. The outcomes (good/excellent), as assessed by the patient and doctor, were tabulated relative to patients operated anteriorly (with or without fu-

sion) and those operated posteriorly. Patients classified as 'good/excellent' had relief of symptoms and no recurrence of symptomatology. A statistical comparison was then made between the two groups (t test indicating p values).

Results

Of the 6,000 patients analyzed, 2,888 (48.1%) were operated on anteriorly with discectomy, with or without fusion. Laminoforaminotomies/keyhole facetectomies with removal of the nerve root compression were done on 3,112 (51.9%) patients.

Disc herniations were at multiple cervical levels; however, the majority occurred at C5-6 and C6-7. Specifically, the disc herniations occurred as follows: C3-4: 3%, C4-5: 9%, C5-6: 39%, C6-7: 46% and C7-T1: 3% (table 1).

The 6,000 patients were followed for a mean of 7.1 years. Those operated on anteriorly were followed for 5.9 years, while the patients operated on posteriorly were followed for 8.5 years. In patients with anterior cervical discectomies, results were the same with or without fusion. The overall good/excellent results were rated 87%, while anterior operations were 80% and posterior procedures were 94%. The difference was statistically significant ($p < 0.05$).

Discussion

Operations for cervical disc herniation are some of the most gratifying operations done by neurosurgeons. The posterior operation for cervical disc herniation was the first of the two general operations done as devised by Spurling and Scoville [22]. Decompression of the cervical nerve root, by removing the herniated portion of the disc, gave relief from the radiating arm pain as well as the motor and/or sensory symptomology. The procedure was refined by Scoville to the keyhole facetectomy [26]. Patients had immediate relief of the symptomology.

In 1955, Robinson and Smith [29] introduced the anterior approach to cervical disc herniation, which involved discectomy with interbody fusion. In 1958, Cloward [3] published his anterior approach, including his method of fusion. Many series of such anterior operations have been published, and all authors have noted gratifying results (table 2).

Over the ensuing years the popularity of the anterior operation, with or without fusion, has greatly increased.

Table 1. Levels of disc herniation

C3-4	3%
C4-5	9%
C5-6	39%
C6-7	46%
C7-T1	3%

Instrumentation further increased the popularity of anterior discectomy as the fusion procedure became simplified. Fewer surgeons performed the posterior operation for cervical disc herniation; however, surgeons still noted how successful that procedure was as well (table 3).

Our analysis showed that most surgeons considered both operative procedures – anterior and posterior – to give good results in treating cervical disc herniation/cervical radiculopathy. However, the question for which we wished to find the answer was how similar are the long-term results of the two methods, and if there was any significant difference between the two.

Unlike previous series (anterior or posterior), which for the most part comprised a range of less than 100 patients to hundreds of patients, the present analysis of 6,000 patients operated on for cervical disc herniation/cervical radiculopathy had many more numbers of operations. Equally, the follow-up was long, averaging almost 6 years in the anterior group and 8 years in the posterior group, thereby yielding a greater percentage of good/excellent results with the posterior technique (94%) than the anterior one (80%).

The findings were unexpected because initially we assumed that good/excellent results would be similar in both methods. The difference cannot be ascribed to small sample size, as this series had 6,000 patients. Mean follow-up times were significant in both groups. Initially, over 4,000 patients were studied and, because of the unexpected results, the study was expanded to 6,000 patients. The results were the same. It is inconceivable that one group of patients/surgeons graded the outcome of 'anterior patients' differently relative to 'posterior patients'. Any variations would have been insignificant because of the large number of patients in each group; therefore, the difference is real.

A difference of 14% in 6,000 patients is significant ($p < 0.05$). Certainly, with a series of this size, the difference is due to something other than chance. The probable explanations for such a difference may be that the posterior operation visualizes the cervical nerve root more

Table 2. Anterior approach

Authors	Number of patients	Mean follow-up, years	Good/excellent results, %
Dan [4], 1998	476	3.6	89
Ruetten et al. [23], 2008	100	2	94
Dowd and Wirth [5], 1999	84	4.5	98 ¹
Gore and Sepic [6], 1984	146	3.3	78
Gore and Sepic [7], 1998	50	21	84
Hamburger et al. [8], 2001	249	12.2	78
Klaiber et al. [13], 1992	61	6.7	87
Hubach [11], 1994	179	10.4	84
Lunsford et al. [15], 1980	253	4	67
Martin et al. [16], 1999	317	2.8	not given
Rao et al. [20], 2008	34	4	76
Wirth et al. [33], 2000	50	4.4	96
Watters and Levinthal [32], 1994	62	6	95
Nandoe Tewarie et al. [18], 2007	456	7	68
Schlosser et al. [25], 2006	219	6.4	not given
van den Bent et al. [31], 1996	81	2	73
Yue et al. [34], 2005	71	7.2	82
Overall	2,888	5.9	80

¹ 'Helped' by the procedure (phone interview).

Table 3. Posterior approach

Authors	Number of patients	Mean follow-up, years	Good/excellent results, %
Scoville et al. [26], 1976	175	21 ¹	95
Henderson et al. [9], 1983	736	8	92
Clarke et al. [2], 2007	303	7	96
Jagannathan et al. [12], 2009	162	6.4	95
Korinth et al. [14], 2006	292	6	97
Zeidman and Ducker [35], 1993	172	2	97
Tomaras et al. [30], 1997	200	2	93
Ruetten et al. [23], 2008	100	2	97
Wirth et al. [33], 2000	22	5.3	100
Hilton [10], 2007	222	2.2	95
Caglar et al. [1], 2007	84	7.8	96
Murphey et al. [17], 1973	644	up to 28	91
Overall	3,112	8.5	94

¹ 5–33 years.

completely; however, good visualization of the nerve root is obtained with the anterior operation as well; therefore, this explanation does not satisfactorily account for the statistically significant difference. 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. Further studies should focus on this to help elucidate the reason(s) for the difference.

Conclusion

In the 6,000 patients with long-term follow-up (mean: 7.1 years), those patients operated on posteriorly had a higher percentage of good/excellent results than those who had been operated on anteriorly.

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Disclosure Statement

None.

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