

ISSN 1220-8841 (Print)
ISSN 2344-4959 (Online)

ROMANIAN
NEUROSURGERY

Vol. XXXVIII | No. 4

December 2024

Subaxial transfacet fixation with/without
laminectomy for cervical compressive
myelopathy. A single institution tailored
approach

Ahmed Ansari,
Faiz Khan Yusufi,
Nikhil Wadhwan

DOI: 10.33962/roneuro-2024-164



Subaxial transfacet fixation with/without laminectomy for cervical compressive myelopathy. A single institution tailored approach

Ahmed Ansari, Faiz Khan Yusufi, Nikhil Wadhwan

Department of Neurosurgery, JawaharLal Nehru Medical College,
AMU, Aligarh, UP, INDIA

ABSTRACT

Introduction. Cervical compressive myelopathy manifests mainly as spastic paralysis, exaggerated reflexes, and clumsiness of the hand, with/without gait disturbances. It mainly results from degenerative changes in cervical spine along with infolding of the ligamentum flavum, the presence of spondylolisthesis, the development of osteophytes, and the hypertrophy of facet joints. Though the recent pathology appears to be facet instability, hence facet fixation with or without laminectomy in these patients should be advocated.

Materials and Methods. 25 patients with cervical compressive myelopathy were operated with transfacet cervical spine fixation with or without laminectomy, decided on the basis of clinical symptomatology and MRI features.

Results. All patients with laminectomy showed improved power and significant lightness in limbs post-surgery. In two patients, there was CSF leak, which was stopped by suture re-enforcing of the wound, and one patient required a lumbar drain to be kept for five days. One patient had a temporary deterioration of power in the left upper limb. Among patients undergoing only transfacet fixation, one patient had no change in symptoms, and three patients had a significant lightness in limbs.

Conclusion. The decision to perform transfacet fixation with laminectomy versus transfacet fixation alone is based on the severity and type of spinal cord compression and the clinical presentation of the patient.

INTRODUCTION

Cervical compressive myelopathy is a condition in which there is compression of the cervical part of the spinal cord, which manifests in the form of spastic paralysis, exaggerated reflexes, and clumsiness of the hand, with/without gait disturbances. Degenerative changes typically occur from C4-7 levels due to the increased range of motion in these areas. Other factors that can narrow the spinal canal include the infolding of the ligamentum flavum, the presence of spondylolisthesis, the development of osteophytes, and the hypertrophy of facet joints^{8,9,10}. Cervical myelopathy often leads to compression of the lateral corticospinal tracts, affecting voluntary control of skeletal muscles and

Keywords

cervical compressive
myelopathy,
laminectomy,
transfacet screw



Corresponding author:
Ahmed Ansari

Department of Neurosurgery,
JawaharLal Nehru Medical College,
AMU, Aligarh, UP,
India

ahmed.ansari2@gmail.com

Copyright and usage. This is an Open Access article, distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>) which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is unaltered and is properly cited.

The written permission of the Romanian Society of Neurosurgery must be obtained for commercial re-use or in order to create a derivative work.

ISSN online 2344-4959
© Romanian Society of
Neurosurgery



First published
December 2024 by
London Academic Publishing
www.lapub.co.uk

the spinocerebellar tracts and impacting proprioception. These impairments commonly result in a wide-based spastic gait and uncoordinated upper extremity movements, which are characteristic of cervical myelopathy. Other spinal cord regions frequently affected include the spinothalamic tracts, which are involved in sensing contralateral pain and temperature; the posterior columns, responsible for the ipsilateral position and vibration sense; and the dorsal nerve root, which affects dermatomal sensation^{4,6,14}. Classically, it is insidious in onset and gradually progressing in nature with functional decline in a stepwise manner. Treatment can be surgical and non-surgical. Conservative management includes using anti-inflammatory medications, engaging in physical therapy, utilising ultrasound therapy, and occasionally administering corticosteroid injections. However, these approaches generally provide temporary relief from pain and are not considered definitive treatments for patients experiencing progressive symptoms. For patients with worsening symptoms, surgical intervention should be strongly considered. The primary goal of surgery is to enlarge the spinal canal, thereby reducing or eliminating compression on the spinal cord. The current trend is to opt for earlier surgical intervention rather than waiting.

Surgery can be in the form of either anterior or posterior decompression of the constricted part and fusion of the vertebra. A posterior approach is generally recommended for cases involving lordosis deformities or when the pathology is located at the back of the spinal canal. Posterior approaches may have a higher risk of infection compared to anterior approaches^{1,3,7,11}. Anterior cervical discectomy and fusion (ACDF) is a standard procedure performed through an anterior approach and can involve up to three disc levels^{2,13}.

We evaluated patients with cervical compressive myelopathy undergoing transfacet cervical spine fixation with or without laminectomy, and tried to streamline certain indications for patients to undergo laminectomy or not.

MATERIAL AND METHODS

This study was conducted on 25 patients with cervical compressive myelopathy in a single institution from June 2022 to May 2024. All of these

patients had varying levels of spastic paralysis, exaggerated reflexes, and clumsiness of the hand, with/without gait disturbances. MRI cervical spine and plain CT cervical spine was done in all patients which showed infolding of the ligamentum flavum, the presence of spondylolisthesis, the development of osteophytes, and the hypertrophy of facet joints. Patients were counselled for surgery. All the patients underwent transfacet fixation of the subaxial cervical spine with or without laminectomy of the involved segments. Among them, 20 had a laminectomy done concomitantly, and five were operated without laminectomy.

Indications for laminectomy were:

1. Significant compression with no CSF sleeve seen.
2. Power less than or equal to 3/5
3. Hoffman's positive
4. Patients having severe spasticity

Indications for Subaxial transfacet fixation without laminectomy were:

1. Patients having some weakness in the grip and shoulder
2. Compression only at the level of lig flavour
3. Patients who can carry out daily activities with some discomfort
4. Patients with heaviness in limbs

ILLUSTRATIVE CASE 1

56 years old male patient with spastic quadriparesis for six months. Power was found 3/5 in upper limbs at all joints and 2/5 in lower limbs. Pre operative MRI sagittal and axial cervical scans (Figure 1. a,c) showed significant compression in subaxial cervical spine with infolding of ligamentum flavum and no CSF sleeve seen. The patient underwent transfacet subaxial cervical spine screw fixation with wide laminectomy from C4-6. Post operative MRI sagittal and axial cervical cuts showed good decompression with CSF sleeve and some malacic changes (Figure 1. b,d). Immediately in the evening of surgery, patient reported significant lightness in his limbs, reduced spasticity and improvement in hand grip. At 3 months follow up, he was able to walk with support and able to perform most daily activities with his hands.

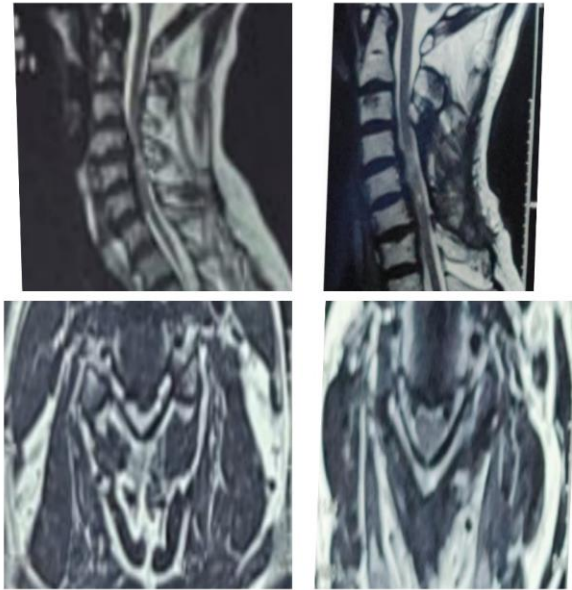


Figure 1. a,c; Pre- operative MRI sagittal and axial images of cervical spine showing significant compression; **b,d:** Showing post operative MRI sagittal and axial scan images of patient with laminectomy.

ILLUSTRATIVE CASE 2

A 72-year-old male patient presented with weakness in hand grip and shoulder with clumsiness in limbs for 2 years. He was able to walk with some support, but otherwise able to carry most of his daily activities. MRI sagittal cervical spine showed compression of cervical spine with inbuckling of ligamentum flavum, but some preserved CSF sleeve (Figure 2a). Transfacet screw fixation was performed without laminectomy. In post operative period, patient reported lightness in limbs. Post operative MRI sagittal scan showed well preserved CSF sleeve (Figure 2 b). At 6 months follow up, he was able to walk with some support and able to carry his daily activities.



Figure 2. a,b; Showing Pre and post op MRI sagittal scan images of patient without laminectomy.

ILLUSTRATIVE CASE 3

A 35 year old lady presented with weakness in bilateral upper and lower limbs for 6 years. Power was found 4/5 in bilateral limbs with significant reduced hand grip. Pre operative MRI sagittal and axial cervical scans showed significant compression in cervical spine with no CSF sleeve (Figure 3 a,c). The patient underwent transfacet C2-7 cervical spine screw fixation with C3-6 laminectomy and C2 laminoplasty. The patient reported improvement in hand grip in post operative period. Post operative MRI sagittal and axial cervical cuts showed preserved CSF sleeve (Figure 3 b,d).

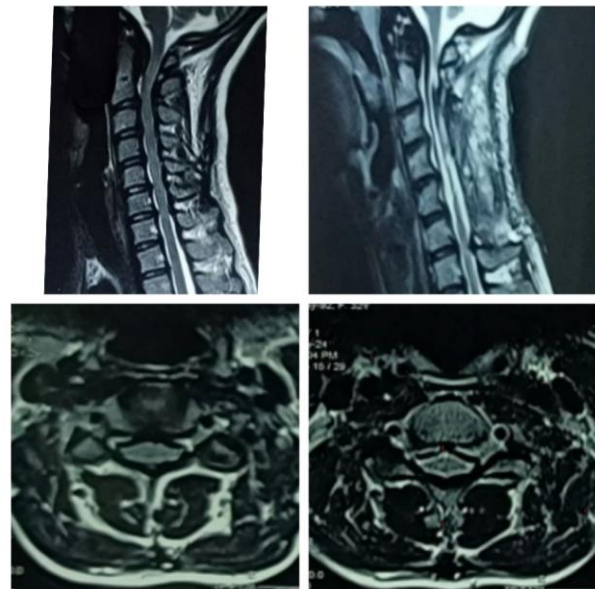


Figure 3. a,c; Pre-operative MRI sagittal and axial scan images of patient showing severe compression with no CSF sleeve, **b,d;** post operative MRI sagittal and axial cuts in the same patient with transfacet fixation with laminectomy.

RESULTS

All of these patients were followed up for a minimum of six months. All patients with laminectomy showed improved power and significant lightness in limbs post-surgery.

In two patients, there was CSF leak, which was stopped by suture re-enforcing of the wound, and one patient required a lumbar drain to be kept for five days.

One patient had a temporary deterioration of power in the left upper limb, which improved on conservative management over the next three days. Among patients undergoing only transfacet fixation, one patient had no change in symptoms, and three

patients had a significant lightness in limbs. They could carry out their daily activities on their own.

DISCUSSION

The cervical spine bears a significant portion of compressive loads, with 36% transmitted through the anterior column and 64% through the posterior column, specifically via the facet joints. There is considerable debate over the best surgical approach for multilevel cervical myelopathy. Anterior surgery is favoured for directly removing compressive issues like disc herniations and osteophytes and is particularly beneficial for myelopathy involving one or two segments. However, when three or more segments are affected, the increased complication rates, especially those related to long fusion grafts, make anterior surgery less appealing.

In contrast, posterior surgeries provide indirect decompression, are technically simpler than multilevel anterior corpectomies, and avoid the complexities of reconstructing the anterior column. They also allow for faster decompression across multiple segments, which is advantageous for patients needing urgent relief.

Surgeons must be aware of the potential destabilising effects when performing surgery, primarily through a posterior approach. Procedures, such as laminectomy, can disrupt the spine's stability. This disruption can lead to instability or deformity if not carefully managed. The potential for these outcomes necessitates a thorough understanding of the biomechanical consequences of surgical interventions in this region.

Laminectomy is often considered in cases where there is significant compression of the spinal cord, leading to severe neurological symptoms. When there is substantial Compression with No CSF Sleeve, the cerebrospinal fluid (CSF) sleeve around the spinal cord acts as a protective cushion. This CSF sleeve may be obliterated when significant compression occurs, meaning the spinal cord is in direct contact with the compressing structure (e.g., bone, disc material). The absence of a CSF sleeve around the compressed spinal cord indicates severe compression, which could lead to irreversible damage to the spinal cord if not relieved. A laminectomy helps by removing the lamina, thereby decompressing the spinal cord and restoring some space for the CSF. Secondly, when the Power is Less Than or Equal to $\frac{3}{5}$, the patient has significant muscle

weakness, mainly due to spinal cord compression. This level of weakness suggests that the nerve impulses from the spinal cord to the muscles are significantly impeded. The power (3/5 or less) typically indicates that the spinal cord compression is severe enough to interfere with motor function, so laminectomy is indicated to relieve this compression and prevent further neurological deterioration. Thirdly, when Hoffman's sign is positive, the spinal cord is compressed enough to alter its normal function, particularly in the cervical spine. A positive Hoffman's sign is an indication of severe compressive cervical myelopathy, which is suggested by hyperreflexia; it is a sign warranting decompressive surgery like laminectomy.

Lastly, when a patient has severe spasticity - Spasticity occurs when there is damage to the upper motor neurons in the spinal cord, which are responsible for controlling muscle tone. Severe spasticity is often a sign of significant spinal cord compression. A laminectomy can relieve the pressure on the spinal cord, which may help reduce the spasticity and improve the patient's quality of life.

Indications for Transfacet Fixation Without Laminectomy. It is done in cases where laminectomy is unnecessary, and stabilisation through transfacet fixation alone might suffice.

Patients with Some Weakness in Grip and Shoulder- Mild to moderate weakness in the grip and shoulder suggests a mild degree of nerve compression. Still, it is not severe enough to cause profound motor deficits or significant disability. In these cases, the goal is stabilising the spine to prevent further deterioration without decompression. The compression might not be severe enough to necessitate a laminectomy, and the patients can be managed with a less aggressive approach, i.e. fixation alone. Secondly, when compressions only at the level of Ligamentum Flavum. In some patients, ligamentum flavum can thicken and compress the spinal cord or nerves. Still, this compression is typically less severe than that caused by bony structures or herniated discs. If the compression is limited to the ligamentum flavum, stabilising the spine might be sufficient without a laminectomy. This approach is often chosen when the compression is not causing severe symptoms or when the ligament can be managed without more extensive surgery. Thirdly, when the patient can perform daily activities with some discomfort, it

suggests no significant compression. These patients might experience symptoms like mild pain or heaviness, but they can still manage their routine tasks; since these patients are not severely debilitated, a more conservative approach with just transfacet fixation might be appropriate. The fixation stabilises the spine, preventing further degeneration or instability without requiring more invasive decompression. Lastly, the Patients with Heaviness in Limbs- The heaviness in the limbs is an early sign of myelopathy, where the patient feels a sense of weakness or fatigue in their arms or legs but without severe weakness or spasticity. In this situation, the goal might be to stabilise the spine to prevent the progression of symptoms. The absence of more severe signs, like significant weakness or spasticity, suggests that decompression via laminectomy might not be necessary, and fixation alone could be sufficient to manage the condition.

The root cause of cervical compressive myopathy appears to be facet instability, which leads to a cascade of pathologies causing cord compression^{5,12}. Few surgeons advocate only fixation of the cervical spine^{5,12}

At times, the compression over the cord by ligamentum flavum is so severe that any fixation provides stabilization only, but does not relieve compression. Laminectomy should be advocated only in those cases; for the remaining cases, just fixation of the posterior surgical spine would suffice.

CONCLUSIONS

The decision to perform transfacet fixation with laminectomy versus transfacet fixation alone is based on the severity and type of spinal cord compression and the clinical presentation of the patient.

Laminectomy with transfacet fixation should be reserved for patients with severe neurological symptoms and significant spinal cord compression, where immediate decompression is necessary to prevent permanent damage.

Transfacet fixation alone is considered for patients with less severe symptoms, where stabilisation might prevent further progression without the need for more invasive decompression.

This tailored approach helps to balance the risks and benefits of surgery, ensuring that patients receive the most appropriate treatment based on their specific clinical presentation.

REFERENCES

1. Acaroğlu E, Nordin M, Randhawa K, Chou R, Côté P, Mmopelwa T, Haldeman S. The Global Spine Care Initiative: a summary of guidelines on invasive interventions for the management of persistent and disabling spinal pain in low- and middle-income communities. *Eur Spine J*. 2018 Sep;27(Suppl 6):870-878. doi: 10.1007/s00586-017-5392-0. Epub 2018 Jan 10. PMID: 29322309.
2. Donnally CJ 3rd, Butler AJ, Rush AJ 3rd, Bondar KJ, Wang MY, Eismont FJ. The most influential publications in cervical myelopathy. *J Spine Surg*. 2018 Dec;4(4):770-779. doi: 10.21037/jss.2018.09.08. PMID: 30714009; PMCID: PMC6330587.
3. Fehlings MG, Kwon BK, Tetreault LA. Guidelines for the Management of Degenerative Cervical Myelopathy and Spinal Cord Injury: An Introduction to a Focus Issue. *Global Spine J*. 2017 Sep;7(3 Suppl):6S-7S. doi: 10.1177/2192568217701714. Epub 2017 Sep 5. PMID: 29164034; PMCID: PMC5684836.
4. Grelat M, Gimenez C, Madkouri R. Cervical Cord Compression by Exostosis. *J Orthop Sports Phys Ther*. 2019 Feb;49(2):112. doi: 10.2519/jospt.2019.7942. PMID: 30704359.
5. Goel A. 'Only fixation' as rationale treatment for spinal canal stenosis. *J Craniovertebr Junction Spine*. 2011 Jul;2(2):55-6. doi: 10.4103/0974-8237.100049. PMID: 23125488; PMCID: PMC3485997.
6. Hitchon PW, Woodroffe RW, Noeller JA, Helland L, Hramakova N, Nourski KV. Anterior and Posterior Approaches for Cervical Myelopathy: Clinical and Radiographic Outcomes. *Spine (Phila Pa 1976)*. 2019 May 1;44(9):615-623. doi: 10.1097/BRS.0000000000002912. PMID: 30724826.
7. Heary RF, MacDowall A, Agarwal N. Cervical spondylotic myelopathy: A two-decade experience. *J Spinal Cord Med*. 2018 Jul 26;42(4):1-9. doi: 10.1080/10790268.2018.1471780. Epub ahead of print. PMID: 30048224; PMCID: PMC6718135.
8. Nagoshi N, Iwanami A, Isogai N, Ishikawa M, Nojiri K, Tsuji T, Daimon K, Takeuchi A, Tsuji O, Okada E, Fujita N, Yagi M, Watanabe K, Nakamura M, Matsumoto M, Ishii K, Yamane J. Does Posterior Cervical Decompression Conducted by Junior Surgeons Affect Clinical Outcomes in the Treatment of Cervical Spondylotic Myelopathy? Results From a Multicenter Study. *Global Spine J*. 2019 Feb;9(1):25-31. doi: 10.1177/2192568218756329. Epub 2018 Oct 15. PMID: 30775205; PMCID: PMC6362553.
9. Nagoshi N, Tsuji O, Okada E, Fujita N, Yagi M, Tsuji T, Nakamura M, Matsumoto M, Watanabe K. Clinical indicators of surgical outcomes after cervical single open-door laminoplasty assessed by the Japanese Orthopaedic Association Cervical Myelopathy Evaluation Questionnaire. *Spinal Cord*. 2019 Aug;57(8):644-651. doi: 10.1038/s41393-019-0258-4. Epub 2019 Feb 21. PMID: 30792540.
10. Nakajima H, Uchida K, Taguchi T, Yamashita T, Tominaga

- T, Tanaka M, Yamagata M, Kaito T, Ushida T. Multicenter cross-sectional study of the clinical features and types of treatment of spinal cord-related pain syndrome. *J Orthop Sci.* 2019 Sep;24(5):798-804. doi: 10.1016/j.jos.2019.01.012. Epub 2019 Feb 15. PMID: 30777363.
11. Park MK, Lee SJ, Kim SB, Lee KW, Lee HJ, Han EY, Kim BR. The effect of positive changes during intraoperative monitoring of the functional improvement in patients with cervical compressive myelopathy. *Clin Interv Aging.* 2018 Jul 5;13:1211-1218. doi: 10.2147/CIA.S163467. PMID: 30013332; PMCID: PMC6038868.
 12. Rhee JM, Basra S. Posterior surgery for cervical myelopathy: laminectomy, laminectomy with fusion, and laminoplasty. *Asian Spine J.* 2008 Dec;2(2):114-26. doi: 10.4184/asj.2008.2.2.114. Epub 2008 Dec 31. PMID: 20404967; PMCID: PMC2852088.
 13. Zakaria HM, Bazydlo M, Schultz L, Pahuta MA, Schwalb JM, Park P, Aleem I, Nerenz DR, Chang V; MSSIC Investigators. Adverse events and their risk factors 90 days after cervical spine surgery: analysis from the Michigan Spine Surgery Improvement Collaborative. *J Neurosurg Spine.* 2019 Feb 15;30(5):602-614. doi: 10.3171/2018.10.SPINE 18666. PMID: 30771759.
 14. Zhang L, Chen J, Cao C, Zhang YZ, Shi LF, Zhai JS, Huang T, Li XC. Anterior versus posterior approach for treating multilevel cervical spondylotic myelopathy: a meta-analysis and systematic review. *Arch Orthop Trauma Surg.* 2019 Jun;139(6):735-742. doi: 10.1007/s00402-018-03102-6. Epub 2019 Feb 9. PMID: 30739192.