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Lateral Mass Screw versus Transfacet Screw Fixation for Cervical Myelopathy: An Institutional Experience

Dr. Alla Anusha [1], Dr. G. M. Niban[2], Dr. R. R. Ramkumar[3]

Department of Neurosurgery, Kanyakumari Medical College and Hospital

Abstract: ***Aims and Objectives**: Posterior subaxial cervical fusion with lateral mass screw and rod instrumentation is a widely used fixation technique. Subaxial transfacet screw fixation is a relatively unknown fusion technique. This study evaluated the outcomes of cervical decompressive laminectomy with lateral mass fixation versus transfacet fixation. **Materials and Methods**: This study compared 20 patients who underwent cervical decompressive laminectomy with lateral mass fixation to 20 who underwent transfacet fixation. The modified Japanese orthopedic association score (mJOA) scale, Nuricks grade assessment were employed to quantify the functional result. The clinical follow-up period lasted 6months. **Results**: Demographically males are more seen as subjects in our study, a higher impact of etiological variables on the elderly age group. There was significant difference in mJOA score preoperatively and postoperatively in both groups. There were significant changes in Nuricks functional grade in both groups upto grade 3 with little or no change in grade by either of procedure for grades 4 and 5. There was significant difference in operative time, blood loss favoring towards transfacet group. **Conclusion**: Both of the posterior instrumentation methods revealed similar results in terms of neurological endpoints. Traditional screw placement options may be limited due to altered anatomy caused by congenital deformity, tumor, trauma, infection, or failed lateral mass fixation. Transfacet screw placement is a good alternative option for posterior cervical fusion with good efficacy rates in comparison with traditional techniques of screw placement***

Keywords: Lateral mass, Transfacet, modified Japanese orthopedic association score, Nuricks grade

1. Introduction

Spinal cord dysfunction is a leading cause of disability across all age groups, with cervical pathology- particularly degenerative cervical myelopathy (DCM)—being the most common etiology in adults and the elderly[1–3]. Degenerative cervical changes are prevalent and increase with age[4], and individuals with congenital cervical canal stenosis are at heightened risk for myelopathy due to superimposed degeneration and spinal cord compression[4–7]. DCM is characterized by progressive, non-traumatic cervical cord compression[8] and is more common in males and Asian populations[8]. Without timely intervention, 20–60% of patients experience neurological deterioration, emphasizing the need for early surgical decompression[9].

Surgery remains the treatment of choice for moderate to severe DCM[10]. Approaches are broadly classified as anterior or posterior decompression, with selection guided by compression site, segment number, sagittal alignment, anatomy, symptoms, and prior cervical surgeries[11]. Posterior decompression, with or without fusion, offers advantages including multilevel decompression, avoidance of major vessels and easy decompression of nerve roots, motion preservation, and reduced morbidity associated with arthrodesis[12-13]. Posterior cervical fixation has evolved from Hadra's spinous process wiring (1891)[14], Rogers' figure-of-eight wiring (1942)[15], and Bohlman's triple-wire technique[16], to trans-facet fixation (1972) and lateral mass screw fixation (1979)[17].

In this study the clinical and functional outcomes of lateral mass fixation versus trans-facet fixation in CSM patients were assessed.

2. Materials and Methods

This is retrospective study in a single tertiary center in Tamil Nadu during period of 2024 to 2025.This study is conducted gathering all patients records who underwent posterior approach of cervical decompression and fusion with either lateral mass screws or transfacet screws placement. A total of 40 patients were identified and used as study population basis.

Inclusion criteria: clinical and radiological findings consistent with cervical spinal cord dysfunction, spinal canal compromise at more than two consecutive spinal levels

Exclusion criteria: age<18years, primary combined anterior and posterior approaches, previous anterior or posterior decompression surgeries, infective or neoplastic etiology, seronegative and seropositive spondyloarthropathies, musculoskeletal diseases.

Grouping- the study population of patients who underwent posterior decompression and fusion with either Lateral mass screw placement or Transfacet screw placement was categorized into two groups. Group 1 involving 20 patients who underwent fusion with Lateral mass screw placement and Group 2 involving 20 patients who underwent fusion with Transfacet screw placement.

3. Surgical Procedure

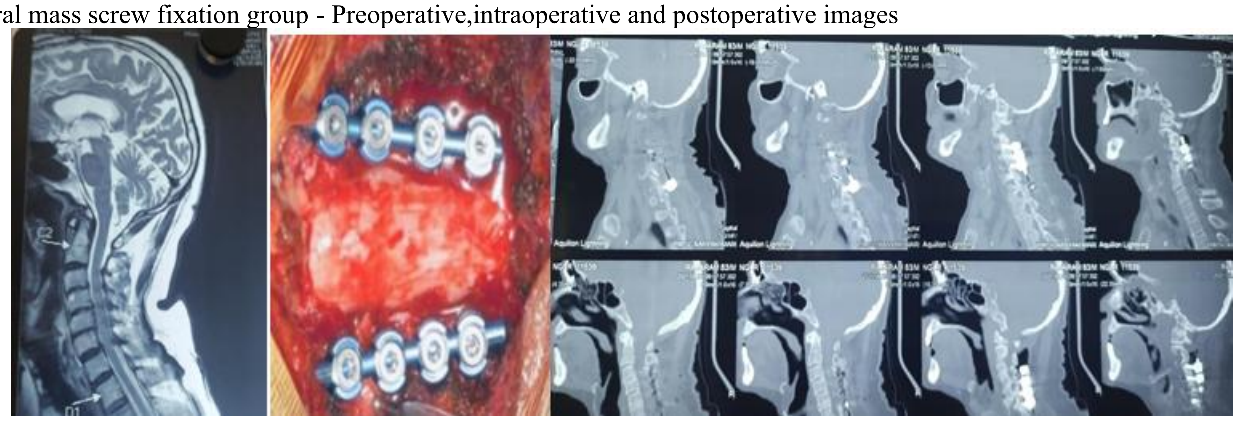
In both study groups initially with posterior midline incision subperiosteal dissection and exposure of bilateral lateral mass and facets is done followed by using following techniques according to their group. The technique followed for lateral mass screw placement was Magrel technique [18] and that for transfacet group was Takayasu et al [19]. The trajectory of screw was guided by C-arm, integrity of pathway was confirmed with balltip probe.Later in transfacet screw placement group decortication was done between lateral mass and facetal joint .Finally rods were placed and later decompression of spinal cord was performed by laminectomy and removal of hypertrophied ligamentum flavum exposing the cord. Bony fusion was done in transfacetal group at decorticated area before closure.

In group 1 – the entry point of screw is identified at 2mm inferior and 2mm medial to center of the lateral mass with trajectory of screw directed superior and approximately 25^0 lateral to axial plane parallel to spinous process of lower vertebra.

In group 2 – the entry point of screw is 2mm caudal to center of lateral mass with no angulation in coronal plane and perpendicular to facetal joint in sagittal plane with trajectory directed craniocaudal.

Below two image panels are examples of two cases who were diagnosed with cervical myelopathy and underwent lateral mass screw and transfacet screw fixation.

Lateral mass screw fixation group - Preoperative,intraoperative and postoperative images



Transfacetal screw fixation
Transfacet screw fixation group - Preoperative, intraoperative and postoperative images

The preoperative and postoperative clinical symptoms, neurological status were documented and evaluated in terms of modified Japanese orthopedic association score (mJOA) scale, Nuricks grade. The radiological assessment was done with x-ray cervical spine in AP, Lateral views, dynamic studies in flexion and extension, CT cervical spine and MRI cervical spine. The postoperative follow-up was done for 6months with x-ray cervical spine at immediate postoperative duration, at 3months,6 months.

4. Statistical Data

The statistical evaluation was performed using the Statistical Package for Social Sciences (SPSS) for Windows 20 (IBM SPSS Inc., Chicago, IL) software. The numerical variables were analyzed in terms of mean, range. The categorical variables were analyzed in terms of frequency and percentage. The Student t-test was used to compare numerical variables The categorical variables were compared using the Chi-square and Fisher's exact Chi-square tests. P-values < 0.05 were considered statistically significant.

5. Results

The study population of 40 patients with 20 under group1(lateral mass screw placement) and 20 under group2 (transfacet screw placement) were included.

Demographic table

Variable	Group1	Group2
Age	54.8±7.6	64.8±9.4
Sex		
Male	18(90%)	17(85%)
Female	2(10%)	3(15%)

Modified JOA score

Group name	Preoperative score	Postoperative score	P value	Δp value
Group 1	8.7±2.04	12.4±2.14	<0.001	<0.001
Group 2	9.4±1.25	10.9±1.6	0.002	

Nurick's Grade	Group 1			Group 2		
	preop	pod5	At 6th month	preop	pod5	At 6th month
Grade 0	0	0	0	0	0	0
Grade 1	5	4	5	4	6	7
Grade 2	4	4	5	7	6	6
Grade 3	4	6	5	4	4	3
Grade 4	6	5	4	4	3	3
Grade 5	1	1	1	1	1	1

Operative and Postoperative rates

Variable	Group 1	Group 2	P value
Duration of surgery	100 ± 13.8	90±14.17	0.048
Blood loss	380 ± 70.58	290 ± 57.22	<0.01
Vertebral artery injury	0	0	
Change of procedure/level	3	1	
Surgical site infection	2	1	
Dural leak	0	0	
Reexploration	2	0	
Length of hospital stay	11.4± 1.95	10 ±0	0.015

6. Discussion

This is a retrospective study of 40 patients admitted in Kanyakumari government medical college under NS with cervical myelopathy features and underwent posterior decompression with fusion by either of these techniques from 2024 and 2025 with each group containing 20 patients who are randomly selected on serial consecutive basis. All these patients have been followed thoroughly upto 6months for the study on OP basis

Group I has 20 patients,in which 18 are male (90%) and 2 are female (10%). Of the 20 patients in Group II, 17 were male (85%) and 3 were female (15%). Males were more affected than females in both groups due to greater trauma exposure. This was consistent with another study by O'Laoire and Thomas [20], which reported male predominance in both fixation groups

Age ranged from 42 to 65 years with a mean of 54.8±7.6 in Group I and from 40 to 60 years with a mean of 64.8±9.4 in Group II. According to study conducted by O'Laoire and Thomas [20], the average age noted was 47years.

Both fixation techniques in our study resulted in statistically significant improvement in neurological function, as measured by mJOA score and Nurick's grade at 6-month follow-up. Improvement was observed across all grades of myelopathy, although patients with severe preoperative deficits (Nurick grades 4–5) showed limited recovery. These findings are comparable to those reported by Singh et al.,[21] who demonstrated significant improvement in mJOA and Nurick scores in both LMS and TFS groups, with no statistically significant difference between the two fixation techniques. Kumar et al. [22] reported neurological improvement in 76–80% of patients undergoing posterior decompression with lateral mass fixation, a rate similar to that observed in our lateral mass group.

A significant finding in our study was the shorter operative time in the transfacet screw group (90 ± 14.17 minutes) compared to the lateral mass screw group (100 ± 13.8 minutes). This reduction was statistically significant and clinically relevant.Takayasu et al.[24] Singh et al.[21] similarly reported reduced operative duration with transfacet fixation, attributing this to the shorter screw trajectory, reduced muscle dissection, and absence of rod-based construct assembly.

Mean intraoperative blood loss was significantly lower in the transfacet group (290 ± 57.22 ml) compared to the lateral mass group (380 ± 70.58 ml). Increased blood loss in the lateral mass group can be explained by wider lateral dissection, longer operative time, and greater exposure of epidural and paravertebral venous plexuses. Comparable findings were reported by Singh et al. and Klekamp [25] who noted that limited exposure and reduced instrumentation bulk contribute to decreased blood loss in transfacet constructs.

There was no statistically significant difference with respect to postoperative complications. No cases of spinal cord injury, nerve root injury, or vertebral artery injury were encountered in either group. Superficial surgical site infections were observed in two patients in the LMS group and one patient in the TFS group, all of which resolved with appropriate antibiotic therapy and local wound care. No cases of screw loosening, pull-out, or implant failure were observed during the follow-up period.

The low complication rates observed in the present study are consistent with previously published large clinical series. Heller et al.26 and Kast et al.[26,27] reported nerve root injury rates of 0.69%, screw loosening rates of 1.17%, surgical site infection rates of approximately 1.3%, facet breakout rates of 0.2%, and no vertebral artery injuries in patients undergoing posterior cervical decompression with lateral mass fixation. Similarly, Graham et al.[28] reported a 6.1% incidence of screw malposition and a 1.8% incidence of radiculopathy per screw, with no vertebral artery injuries, further supporting the overall safety of lateral mass fixation when proper technique is employed.

With respect to transfacet fixation, Takayasu et al.[24] reported minimal complications and no neurovascular injuries when strict adherence to anatomical landmarks and fluoroscopic guidance was maintained. The absence of major neurovascular complications in our transfacet cohort reinforces these findings and highlights that transfacet fixation, although technically demanding, can be performed safely in appropriately selected patients and in experienced hands.

The mean duration of hospital stay was significantly shorter in the transfacet group (10 ± 0 days) compared to the lateral mass group (11.4 ± 1.95 days). This reduction in hospital stay can be attributed to lower intraoperative blood loss, shorter operative time, and earlier postoperative mobilization in the transfacet cohort. Similar observations were reported by Singh et al.,[21] who demonstrated reduced hospital stay and perioperative morbidity in patients undergoing transfacet fixation.No implant-related complications were identified in either group during the 6-month follow-up.

7. Conclusion

Transfacet screw fixation yields neurological outcomes comparable to lateral mass fixation, with advantages of reduced operative time, blood loss, and hospital stay, and similar complication rates. Biomechanically, it provides equivalent or superior pullout strength. This technique offers better alternative in altered anatomy, stripped screws, or when additional fixation points are required. Its limitations include facet fractures and fixed cervical kyphosis identified on preoperative dynamic imaging. Meticulous entry point selection is critical, as a caudal entry increases the risk of facet fracture.

8. Limitations of the Study

The transfacet screw fixation technique is technically demanding and requires precise screw trajectory to avoid facet joint violation. The limitations of our study include its retrospective design, small sample size, and short follow-up duration. Nevertheless, the variable-wise comparison with existing literature strongly supports the validity of our findings.

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