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Anterior decompression techniques in cervical myelopathy

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Abstract
The pathophysiology of cervical myelopathy is multifactorial with both static factors causing stenosis and dynamic factors resulting in repetitive injury to the spinal cord. The symptoms are related directly to the degree of compression of the various spinal cord tracts. The use of instruments set for anterior cervical techniques are unique, cervical retractors, Dural hook, high speed burr, cervical distractors, cage, anterior cervical plate of various sizes, variable/ fixed angle giudes for drilling with their respective screws has to be present to complement the standard cervical spine instrumentation set. We compared the two functional scores preoperatively and pre-operatively in our 40 patients and found that the Nurick as well as the JOA score at both 6 weeks and 12 weeks showed a significant improvement which was statistically significant.

Keywords: Anterior Decompression Techniques, Cervical Myelopathy**,** JOA score

Introduction
Cervical myelopathy is a problem usually starting in the middle age with progressive degenerative changes in the cervical disc, eventually leading to compression of the cervical spinal cord and irreversible damage known as cervical myelopathy.
The pathophysiology of cervical myelopathy is multifactorial with both static factors causing stenosis and dynamic factors resulting in repetitive injury to the spinal cord [1]. The symptoms are related directly to the degree of compression of the various spinal cord tracts. Cadaveric studies have shown that the transverse cross-sectional area of the spinal cord and the compressive ratio [compressive ratio=(sagittal diameter/transverse diameter)×100%] of the spinal cord correlate with the severity of pathologic changes [2] and autopsy examinations of patients with CSM have shown gray matter atrophy, neuronal loss, and white matter demyelination [3].
The most common causes being degenerative intervertebral disc herniation as pointed out by Bedford *et al*, that causes altered stress and biomechanics of cervical vertebral and uncovertebral joints causing capsular thickening and osteophyte formation leading to anterior compression of the cord, Park and Punjabi stated that due to loss of disc height a common feature of spondylosis, causes thickening and folding of ligamentum flavum causing a circumferential narrowing of the spinal canal and eventually myelopathy [4].
The dynamic factors that contribute to the pathogenesis of CSM are complex. The spinal cord stretches with flexion of the cervical spine and shortens and thickens with extension. This principle was demonstrated in a classic study by Breig. In extension the posterior half of the cord shortens more than the anterior portion compressing the dorsal column that may account for the difficulties with balance in early stages of CSM. In flexion the cord is draped over the posterior longitudinal ligament (PLL) / vertebral body and held against any spondylotic protrusions causing stretching of the roots causing limb involvement. A significant increase of spinal stenosis has been observed in extension (48% of patients) more so than in flexion (24% of patients) [5].
A thorough understanding of the pathology of cervical myelopathy, clinical examination and radiological evaluation is essential for optimal planning of treatment. Treatment must be individualised.
Conservative management is mainly offered in asymptomatic, mild forms of myelopathy consisting of intermittent cervical immobilization in a soft collar, anti-inflammatory medications and bed rest, active discouragement of high-risk activities and avoidance of

physical overloading, exposure to cold, movement on slippery surfaces, manipulation therapies and vigorous or prolonged flexion of the head. Such measures are not successful in reversing or permanently halting the progression of spondylotic myelopathy [6, 7]. Conservative management mandates regular reviews with clinical and radiological follow up.

Surgical options are anterior, posterior and combined anterior and posterior approaches. The aim of surgery is to relieve the spinal cord compression. There is no best surgical approach as per literature, it best must be individualised. Although an element of surgeon preference will of necessity be involved, some principles can assist in the selection of the appropriate approach.

Methodology

The use of instruments set for anterior cervical techniques are unique, cervical retractors, Dural hook, high speed burr, cervical distractors, cage, anterior cervical plate of various sizes, variable/ fixed angle giudes for drilling with their respective screws has to be present to complement the standard cervical spine instrumentation set.

Cervical cage peak / titanium ring, anterior cervical plate were used for all the cases.

The anterior approach to the cervical spine exposes the anterior vertebral bodies from C3 to T1. It allows for direct access to the disc spaces and uncinate processes in the region. Land marks to be palpated are the sternocleidomastoid muscle, carotid artery, carotid tubercle, hyoid, thyroid and cricoid cartilage. Make a transverse skin crease incision at the appropriate level of the vertebral pathology as marked. The incision should extend slight obliquely from the midline to the posterior border of the sternocleidomastoid muscle. Such an incision has extreme cosmetic advantage. When multiple level surgery in indicated a more oblique incision is recommended. The approach can be either on the left or right side of neck. Left is preferred as the left recurrent laryngeal nerve runs and is protected in the trachoesophageal groove. We routinely approach the neck from the right being right handed surgeons.

The fascial sheath over the platysma is incised along the skin wound which is then cut with cautery/ bluntly dissected parallel to its long fibers. The anterior border of the sternocleidomastoid (STM) muscle is identified and its anterior fascia is incised. The STM is then retracted laterally, while the strap muscles, trachea and oesophagus medially. The pretracheal fascia is dissected with blunt dissection with a peanut and is retracted laterally with STM. The inferior thyroid artery may limit the dissection and might have to be ligated at times. Blunt dissection continues deep medially until the prevertebral fascia is reached. To approach the the lower cervical levels the omohyoid muscle may be cauterised.

The Longus coli and the prevertebral fascia wiil be visible following superficial dissection anterior to the vertebral body. The level is reconfirmed by imaging by placing a spinal needle at the required level, the longus coli and the prevertebral fascia are cauterised in the midline to expose the vertebrae and the anterior longitudinal ligament (ALL). The longus coli and the ALL are then dissected subperiosteally to expose the entire vertebral body.

Once the vertebral body is reached the cervical retractors are applied and the microscope is brought in for magnification and fine dissection. The microscope is carl zeiss opmi vario manification 1.5 to 24.5 X. The involved disc superficial layers are removed using a knife and a pitutory forceps. Cerival distractor pins are applied to the vertebral body and then distaracted with the cervical distractor, the entire disc material is removed untill the Posterior longitudinal ligament (PLL) is seen covering the spinal cord. In the case of a corpectomy a high speed burr is used to remove the involved vertebral body under the microscope. The PLL is cut to decompress the cord.

Once discectomy is done the disc space is replaced with either a bone graft from iliac crest as a block or an artificial disc, disc implant. In case of corpectomy the vertebral body is replaced by a cage, cervical traction is released and the cervical spine is additionally stabilised with an anterior plate with fixed/variable angled screws. The plate is finally locked.

All patients receivied antibiotic prophylaxis to prevent infection by intravenous route of 1.5 g of cefuroxime after induction of anesthesia and 1.5 g every 12 hours for 24 hours. For pain management all patients received 1 g of intravenous paracetamol for a period of 24 hours at 8 hourly interval. Injection Tramadol was administered if pain exceeded tolerable levels.

Drain removal and dressing was done on the first pre-operative day unless the drain was more than 100ml for which it was removed the following day.

The total blood loss was assessed by measuring the drain output at the end of first pre-operative day with the help of a calibrated bottle, the number of soaked gause and pads.

Patients were mobilised with assisted walking with walker on pre-operative day 1 with hard cervical collar. Patients with gait abnormalitiy were given gait training by physiotherapist. All Pateints were advised not to sit continuously for more than half hour for the first 1 month, they were also asked to avoid bending down, lifiting weights for 1 month. They were discharged on pre-operative day 2 unless any untoward circumstansis arrived.

After 1 month the cervical collar was removed and they were asked to gradually return to their normal activitiy.Patients were followed up at 6 week and 12 week interval.

Results

Of the 40 patients included in our study 36 were males (90%) and 4 were female (10%).

Table 1: Sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	36	90.0	90.0	90.0
	Female	4	10.0	10.0	100.0
	Total	40	100.0	100.0	

We also recorded the presence of co-morbidity like diabetes, hypertension and asthma as they could influence the functional outcome of patients. Diabetes mellitus was present in 13(32.5%) of our 40 patients, Hypertension was present in 17(42.5%) of our 40 patients and asthma was present in 3(7.5%) of our 40 patients.

Table 2: Surgery

Surgery performed	Frequency	Percentage
ACDF	33	82.5%
ACCF	7	17.5%

Of the 40 patients that had cervical myelopathy 33 (82.5%) patients underwent anterior cervical discectomy and fusion and 7 (17.5%) patients underwent anterior cervical corpectomy and fusion.

Descriptive Parameteres

1. **Blood Loss:** The average blood loss recorded in our study

was a mean 103.3 +/- 33.75 ml.
2. **Operative Time:** The average operative time in our study was a mean of 98.37 +/- 21.01 min
3. **Length Of Hospital Stay:** the average length of stay was a mean of 2.32 days

Table 3: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Blood loss	40	50.00	200.00	103.3000	33.75492
Operative time	40	75.00	150.00	98.3750	21.01244
Length of Stay	40	2.00	5.00	2.3250	.79703

We also recorded the day of mobilisation of our patients, most of them were mobilised on pre-operative day 1. 8 (20%) patients were mobilised on the same day of surgery. 22(55%) patients were mobilised on pre-operative day 1, 6 (15%) patients on day 2, 3(7.5%) patients on day 3 and 1(2.5%) patient on pre-operative day 4.

Functional Status

Each of our 40 patients were evaluated for their functional status by the Nurick grade and JOA scoring system pre-operatively, at 6 weeks and 12 weeks follow up.

I. Nurick Grade

The mean pre-operative Nurick score was found to be 2.2 $\pm$ 0.79 with a minimum of 1 and a maximum of 4 while at 12 weeks the Nurick grade improved to a mean of 1.6 $\pm$ 0.95 with a minimum of 0 to a maximum of 4.

Table 4: Nurick score statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre op	40	1.00	4.00	2.2000	.79097
Six weeks	40	.00	4.00	1.8750	.82236
Twelve weeks	40	.00	4.00	1.6000	.95542

II. Joa Score

Assessment of the JOA score the mean pre-operative JOA score recorded was 11.8 +/- 2.85 with a minimum of 6 and a maximum of 15 while at 12 weeks the JOA score improved to a mean of 13.67 +/- 2.83 with a minimum of 6 to a maximum of 17.

Table 5: JOA score statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre op	40	6.00	15.00	11.8000	2.85729
Six weeks	40	6.00	17.00	12.8750	2.87507
Twelve weeks	40	6.00	17.00	13.6750	2.83194

The difference in mean of the Nurick grade between pre-operative and 12 weeks (p=0.0001), 6 weeks and 12 weeks were statistically significant (p=0.001) and similarly JOA score at pre-operative and 6 weeks (p=0.0001), pre-operative and 12 weeks (0.0001), 6 weeks and 12 weeks (0.0001) were also statistically significant.

Of the 40 patients, 1(2.5%) patient developed superficial wound infection and 1 (2.5%) patient developed swallowing difficulty at 6 weeks follow up. There was no mortality.

We compared the two functional scores preoperatively and pre-operatively in our 40 patients and found that the Nurick as well as the JOA score at both 6 weeks and 12 weeks showed a significant improvement which was statistically significant with their p values as in the table below.

Table 6: Paired Samples Test

		Mean +/- Sd	P Value	Significance
Nurick Grade	Pre Op	2.2 0+/- 0.79	0.0001	Significant
	6 Weeks	1.87+/-0.82		
	Pre Op	2.2 0+/- 0.79	0.0001	Significant
	12 Weeks	1.60+/-0.95		
Joa Score	Pre Op	11.80+/-2.85	0.0001	Significant
	6 Weeks	12.87+/-2.87		
	Pre Op	11.80+/-2.85	0.0001	Significant
	12 Weeks	13.67+/-2.83		

Discussion

The mean operative time in our study was 98.37 +/- 21.01 minutes. In a similar study conducted by RuoFu Zhu and team [8] the mean operative time was 109.79 +/- 18.97 minutes. While comparing the two approaches ACDF group had a mean operative time of 91.66 minutes and ACCF group had a mean operative time of 130 minutes. The mean operative time for ACDF is lesser when compared to ACCF similar inference was obtained in studies by Jia X-L *et al* ACDF 97.37 minutes and ACCF 141.23 minutes [9].

The amount of blood loss in our study was 103.3 +/- 33.75 ml. In ACDF group a mean of 93.69 ml and in ACCF group a mean of 148.57 ml. The amount of blood loss in ACDF and in ACCF in a study by Liu was 148.3 ml and 263 ml showing that the blood loss is significantly less in ACDF group.

In our study the average duration of hospital stay was 2.32 days, ACDF group is a median of 2.33 days and ACCF group is also 2.28 days. Unlike that of the study by Jia X-L *et al* whose results were 10.79 days for ACDF and 11.11 days for ACCF [9].

In our study we compared the duration of symptoms with age distribution and found that they were not statistically significant. We also studied the effect of functional score with the length of hospital stay and found that they were statistically significant.

We used two scoring systems for the evaluation of the patients

pre-operatively and pre-operatively, Nurick score and the Japanese orthopaedic association score. The mean pre-operative Nurick score in our study is 2.2 +/- 0.79 and the pre-operative score on follow up is 1.6 +/-0.95. In the study conducted by Haroldo chagas *et al* the pre-operative Nurick score was 2.97 and the mean pre-operative score was 2.1. In a study by Hans-Ekkehart Vitzthum *et al* [10]the pre-operative Nurick score was 2.8 and pre-operative score was 2.4. The mean preoperative JOA score in our study is 11.8 and pre-operative follow up score is 13.67. In the study by Hans- Ekkehart Vitzthum *et al* the mean pre-operative JOA score was 11.8 and pre-operative score was 13.8. In a study by Rui Gao *et al.* the mean pre-operative JOA score was 10.7 and pre-operative score was 14.5. There is a significant difference in pre and pre-operative scores in our study as well as other studies implying an improvement in the functional outcome following anterior decompression techniques.

A number of complications have been mentioned in literature but in our study we had one patient (2.5%) who developed superficial wound infection and one patient (2.5%) who developed difficulty in swallowing at12 weeks follow up. In a study by A. H. Daniels *et al* the complications with anterior approach were vertebral artery injury (0.3%), esophageal injury (0.2– 0.4%), wound infection (0.2–1.4%), and dysphagia (28–57%) [11].

The modest number of patients enrolled, the distribution of number of patients were not similar in the two surgical procedure groups making it difficult to compare and infer from them, each level of cervical spine did not have sufficient numbers to be compared. Larger randomised trials are needed with equal distribution in procedure groups with longer duration follow up to help us better understand the pathology, predictive risk factors, complications and also assess the functional outcome.

Conclusion

Surgical management, anterior decompression techniques being anterior cervical discectomy and fusion and anterior cervical corpectomy and fusion have proven to improve the functional outcome, shown by the significant improvement in Nurick and JOA functional status scores. It is also safe procedure with limited complications. Anterior cervical discectomy and fusion has less operative time and blood loss when compared with anterior cervical corpectomy and fusion.

In our study population we found no statistical evidence that prognostic factor such as age and duration of pre-operative symptoms affect the outcome as reported in literature.

Although it's short term effect is satisfactory. Long term randomised control studies are needed to know the middle and long term functional outcome effects.

References

1. Michel Toledano, Bartleson JD. Cervical Spondylotic Myelopathy. Neurol Clin. 2013; 31:287-305
2. Pumberger M, Froemel D, Aichmair A, Hughes AP, Sama AA, Cammisa FP *et al*. Clinical predictors of surgical outcome in cervical spondylotic myelopathy an analysis of 248 patients. Bone Joint J. 2013; 95-B:966-71.
3. RuoFu Zhu, Hui Lin Yang, Zhi Dong Wang, Gen Lin Wang, MinJie Shen, Quan Yuan. Comparisons of three anterior cervical surgeries in treating cervical spondylotic myelopathy BMC Musculoskeletal Disorders. 2014; 15:23
4. Galbraith JG, Butler JS, Dolan AM, O'Byrne JM. Operative Outcomes for Cervical Myelopathy and Radiculopathy. Hindawi Publishing Corporation Advances in Orthopaedics, 2012, 8. Article ID 919153,
5. Xiao-Feng Lian, Jian-Guang Xu, Bing-Fang Zeng, Wei Zhou, Wei-Qing Kong, Tie-Sheng Hou. Non-contiguous anterior decompression and fusion for multilevel cervical spondylotic myelopathy: a prospective randomized control clinical study. Eur Spine J. 2010; 19:713-719
6. Kumar V, Rajbahadur, Kanojia R, Wardak E, kumar A. Outcome of anterior cervical Discectomy and fusion with Autograft plating in management of cervical spondylotic myelopathy. The Internet Journal of spine. 2008, 5(1).
7. Rui Gao, Lili Yang, Huajiang Chen, Yang Liu, Lei Lang, wen Yuan. Long Term Results of Anterior Corpectomy and Fusion for Cervical Spondylotic Myelopathy. PLoS ONE 2012; 7(4):e34811. journal.pone.0034811
8. Kaiser MG, Haid RW, Subach BR, Barnes B, Rodts GE. Anterior cervical plating enhances arthrodesis after discectomy and fusion with cortical allograft. Neurosurgery. 2002; 50:229-38.
9. Jau-Ching Wu, Chin-Chu Ko, Yu-Shu Yen, Wen-Cheng Huang, Yu-Chun Chen. Epidemiology of cervical spondylotic myelopathy and its risk of causing spinal cord injury: a national cohort study. Neurosurg Focus. 2013; 35(1):E10.
10. Praveen K. Yalamanchili, Michael J. Vives, and Saad B. Chaudhary Cervical Spondylotic Myelopathy: Factors in Choosing the Surgical Approach Hindawi Publishing Corporation Advances in Orthopedics 2011, 2012, 6 Article ID 783762.
11. Daniels AH, Riew KD, Yoo JU, Ching A, Birchard KR, Kranenburg AJ *et al*. "Adverse events associated with anterior cervical spine surgery," Journal of 6 Advances in Orthopedics the American Academy of Orthopaedic Surgeons. 2008; 16(12):729-738.