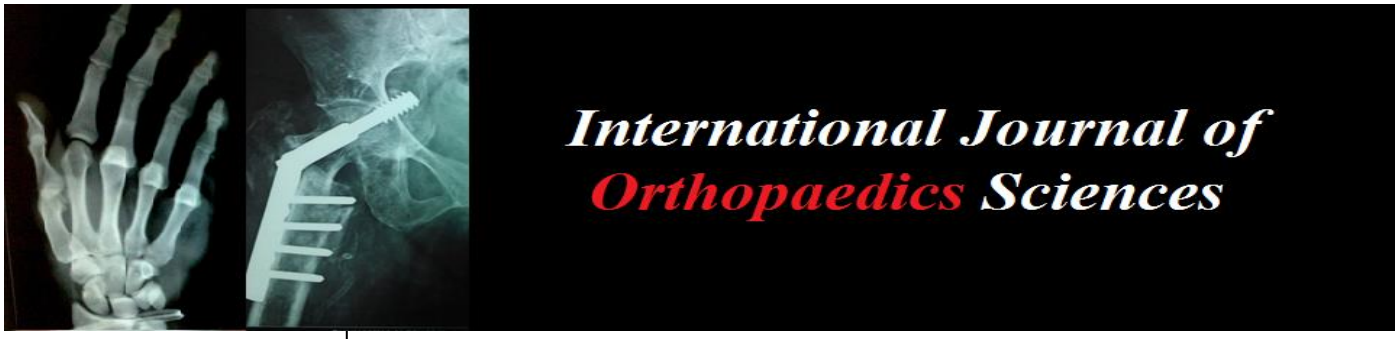


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# An analysis of decompression alone in stable degenerative scoliosis patients in affecting back pain and deformity

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**Abstract**
Degenerative Scoliosis is well known for producing both neurological and mechanical symptoms in addition to producing deformity and sometimes instability. Decompression alone has been treatment of choice in patients with mild deformity with neurogenic claudication or radiculopathy but without instability. However, fusion has been preferred to counter deformity, instability and mechanical forces. We intended to study these variables when treated with decompression alone. We evaluated 38 patients who fulfilled our criteria. Demographic variables like age, gender, duration of symptoms and type of predominant symptom were noted. Clinical evaluation of back pain, deformity angle in supine and standing position was also performed both before and after surgery. Assessment was also done for type of symptoms and levels of decompression. We found no significant changes in deformity or back pain when decompression alone was done in such patients. The patients did improve symptomatically and neurologically. We found that decompression alone can be done to improve non-mechanical parameters in a patient of degenerative stable lumbar scoliosis.

**Keywords:** decompression alone, stable degenerative scoliosis patients, affecting back pain, deformity

## 1. Introduction
Adult spinal deformity (ASD) is a common finding in many patients presenting with backache and spine related ailments. Encompassing a broad group of patients with varying disability and deformity, this entity is often also painful in nature. Along with backache, radiculopathy, claudication and impaired spinal function, quality of life is also commonly affected [1].
As there is a good number of patients with such deformity and backache, it is important that alignment objectives and optimal corrective surgeries are very well understood in order to achieve better and rational outcomes [2]. As surgery is the treatment of choice in many patients, the usual measures include a single level decompression, often facet sparing, so that the nerve roots and spinal canal is adequately released [3]. In addition, posterior instrumentation composed of pedicle screws and rods can be added to prevent postoperative instability following laminectomy. As most of these patients are morbid and elderly with osteoporosis, extensive reconstruction is often difficult and less invasive or minimal procedures alone may be required to produce adequate results as in providing less-invasive options as an opportunity to these patients [4, 5]. This is why Ideal alignment parameters [6-10], fusion level selection, corrective techniques, and instrumentation strategies [11-14] have been recently studied with great interest.
An elaborate discussion has thus followed as to whether posterior instrumentation must be performed or not to stabilize the spine after the laminectomy, as removal of lamina may predispose to further instability [15-18]. Laminectomy alone, according to few authors, may also predispose to progression of curve and iatrogenic lysthesis according to few researchers. All this may manifest as back ache which may be more or equal to pre operative levels at the cost of neurological recovery and a smaller procedure [19-21].
This necessitates need of a study to see post operative back pain and other radiological parameters in patients of our population presenting with adult degenerative scoliosis who have been treated with decompression alone.

## 2. Methods

Our study was intended to include patients who had an adult degenerative spine condition with coronal imbalance. The patients exhibiting complaints such as low back pain, leg pain, numbness, and /or intermittent claudication were shortlisted and clinically evaluated. In such patients those with coronal deformity clinically were further subjected to magnetic resonance imaging. ADS was defined radiographically by coronal curvature (major lumbar curve) measured by the Cobb method [22] with the apex between L2 and L4. A flexion and extension view in standing position was done of Lumbar spine on lateral view to identify patients with sagittal instability and those patients were excluded from the study. Inclusion criteria thus consisted of adult patients (>45 years) with evidence of degenerative scoliosis (cobb's angle>10 degrees) and consisting of leg pain or claudication with or without back pain. Of these, the patients who had sagittal instability, inability to follow up for 1 year or those who were unfit for surgery or anaesthesia were excluded from the study.

A total of 52 such patients who reported to Department of Orthopaedics at Hind Institute of Medical Sciences, Barabanki were included in the study which was carried out between 2018 January to August 2020.

The demographic characteristics of such patients was noted. Age, gender, working level, duration of symptoms was entered. Clinical criterion such as presence of radicular symptoms, back pain, Cobbs angle on Digital radiograph -AP supine and AP standing view was noted. After basic pre-op investigations, these patients were taken up for a pre-anesthetic check up. After check up they were taken up for surgery. All patients gave informed consent for inclusion in the study. The study design was approved by the ethical committee of our institute. Patients were followed up for 1 year. For low back pain, VAS scale was used. Radiographic measurements included lumbar lordosis (Cobb method), apical vertebral rotation (Nash-Moe method) [23], lateral spondylolisthesis of each vertebra (if /any), and scoliosis.

Surgery was performed for spinal stenosis located at the major lumbar curve and/or the compensatory lumbosacral curve below the major lumbar curve. Decompression was achieved through partial facetectomy, flavectomy, laminotomy, and foraminotomy. Intra -operatively if gross instability was detected, posterior stabilization, instrumentation and fusion was done and the patient was excluded from the study. To assess the postoperative residual LBP, the amount of preoperative LBP (VAS /JOA score), the number of levels decompressed, and the preoperative radiographic parameters were compared between the patients with postoperative residual LBP (Group I) and those without postoperative residual LBP (Group II) at 1 year after surgery using the Student's t test or Chi square test, as appropriate. Appropriate statistical tests were performed to determine the risk factors for residual LBP at 1 year after surgery, after adjustment for age and gender. Descriptive data are presented as the mean ± standard deviation. The level of statistical significance was set at 0.05.

## 3. Charts

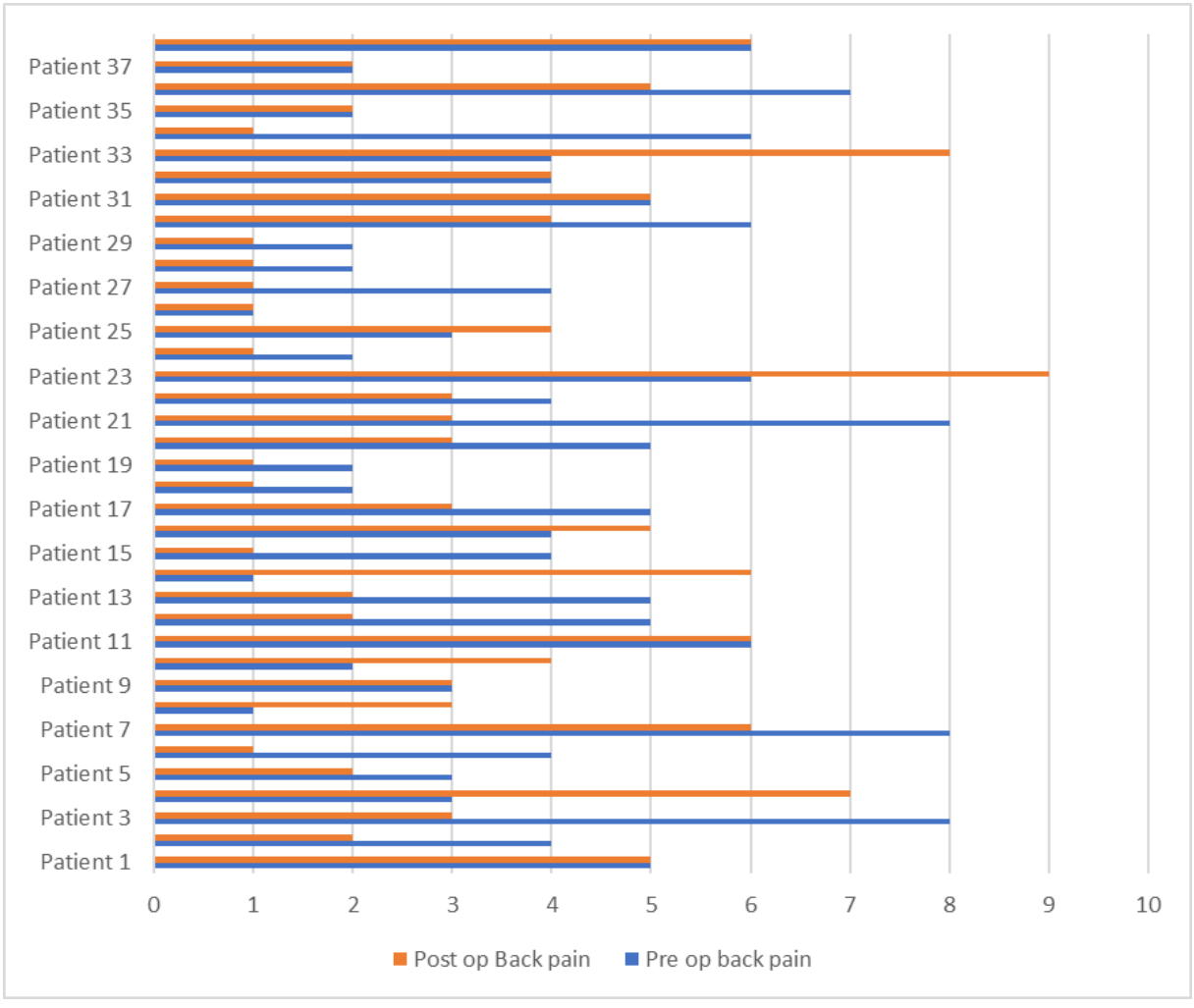


**Chart 1:** Relation of Back pain before and after decompression surgery

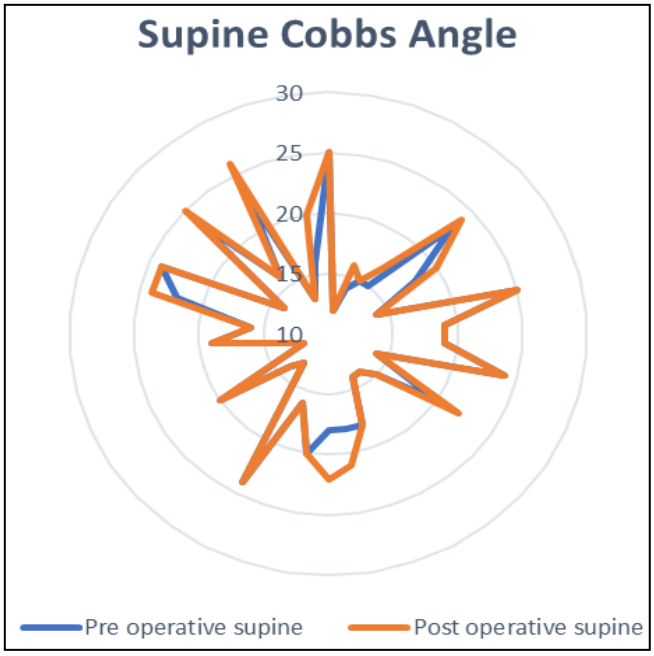


**Chart 2:** Deformity as measured by Cobbs angle in supine position before and after decompression surgery

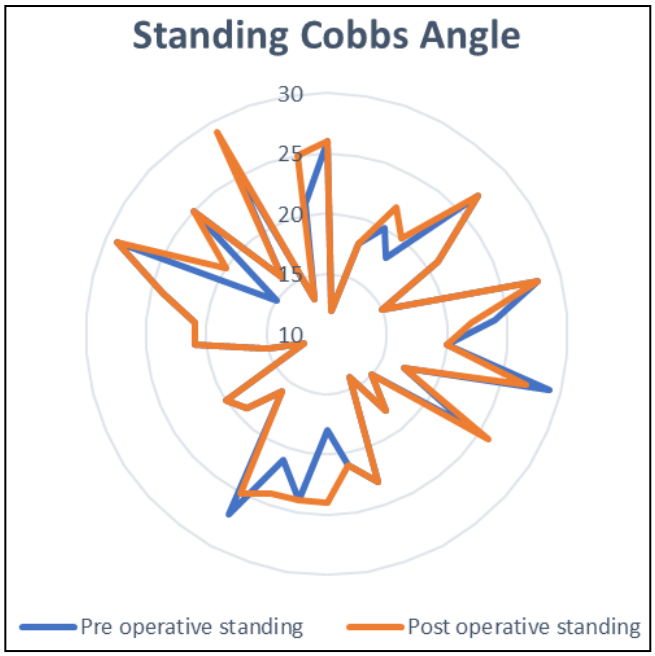


**Chart 3:** Deformity as measured by Cobbs angle in standing position before and after decompression surgery

**Table 1:** Chart showing values of Back pain, deformity and Cobbs angle

| Serial No. | Age | BACK PAIN (VAS) | COBBS angle(°) PREOP SUPINE | COBBS angle (°) PREOP STANDING | nash and moe | Number of levels decompressed | POST OPERATIVE PAIN | COBBS POST OP SUPINE | COBBS POST OP STANDING |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 72 | 5 | 20 | 20 | 2 | 2 | 5 | 20 | 20 |
| 2 | 62 | 2 | 15 | 15 | 0 | 1 | 1 | 15 | 15 |
| 3 | 60 | 6 | 24 | 29 | 3 | 1 | 3 | 24 | 27 |
| 4 | 75 | 3 | 16 | 16 | 1 | 2 | 3 | 16 | 16 |
| 5 | 65 | 2 | 18 | 21 | 1 | 2 | 4 | 21 | 21 |
| 6 | 63 | 5 | 14 | 14 | 0 | 1 | 3 | 14 | 14 |
| 7 | 74 | 3 | 22 | 24 | 2 | 1 | 1 | 24 | 24 |
| 8 | 58 | 5 | 19 | 24 | 1 | 1 | 3 | 19 | 22 |
| 9 | 57 | 5 | 23 | 27 | 2 | 1 | 2 | 24 | 27 |
| 10 | 62 | 4 | 14 | 17 | 1 | 2 | 5 | 14 | 17 |
| 11 | 70 | 6 | 13 | 16 | 1 | 1 | 3 | 13 | 16 |
| 12 | 56 | 8 | 15 | 20 | 1 | 2 | 4 | 15 | 22 |
| 13 | 59 | 2 | 19 | 20 | 1 | 1 | 1 | 19 | 20 |
| 14 | 72 | 4 | 12 | 12 | 0 | 1 | 3 | 12 | 12 |
| 15 | 78 | 1 | 16 | 21 | 1 | 3 | 3 | 20 | 25 |
| 16 | 65 | 3 | 18 | 18 | 1 | 3 | 7 | 22 | 24 |
| 17 | 63 | 4 | 18 | 23 | 1 | 1 | 2 | 18 | 23 |
| 18 | 75 | 2 | 24 | 25 | 2 | 1 | 1 | 25 | 25 |
| 19 | 76 | 6 | 13 | 13 | 0 | 2 | 4 | 13 | 13 |
| 20 | 57 | 2 | 18 | 21 | 1 | 2 | 1 | 20 | 21 |
| 21 | 54 | 7 | 25 | 26 | 3 | 2 | 4 | 25 | 26 |
| 22 | 57 | 4 | 15 | 18 | 1 | 3 | 8 | 17 | 20 |
| 23 | 76 | 6 | 23 | 27 | 1 | 3 | 9 | 26 | 29 |
| 24 | 72 | 8 | 13 | 15 | 0 | 1 | 3 | 13 | 15 |
| 25 | 72 | 4 | 19 | 21 | 1 | 2 | 4 | 19 | 21 |
| 26 | 62 | 1 | 20 | 24 | 2 | 3 | 1 | 22 | 26 |
| 27 | 70 | 2 | 14 | 19 | 1 | 1 | 1 | 14 | 19 |
| 28 | 57 | 6 | 14 | 15 | 0 | 1 | 1 | 14 | 15 |
| 29 | 65 | 2 | 20 | 24 | 2 | 1 | 1 | 20 | 24 |
| 30 | 75 | 3 | 14 | 15 | 0 | 3 | 4 | 14 | 20 |
| 31 | 57 | 4 | 25 | 28 | 2 | 1 | 1 | 25 | 28 |
| 32 | 67 | 5 | 16 | 21 | 1 | 3 | 2 | 16 | 24 |
| 33 | 69 | 5 | 24 | 27 | 3 | 2 | 3 | 24 | 25 |
| 34 | 74 | 8 | 24 | 29 | 2 | 1 | 3 | 24 | 29 |
| 35 | 55 | 4 | 12 | 12 | 0 | 2 | 1 | 12 | 12 |
| 36 | 62 | 4 | 14 | 18 | 1 | 1 | 1 | 14 | 18 |
| 37 | 56 | 1 | 14 | 18 | 1 | 2 | 6 | 16 | 18 |
| 38 | 62 | 3 | 14 | 18 | 1 | 1 | 1 | 14 | 18 |

## 4. Results

38 (Thirty eight) patients were eventually included in the study. Out of the initial 46 patients, 3 patients were found unfit or high risk for surgery. 5 patients had documented radiological sagittal instability and 6 patients did not complete the follow up. There was no expiry in the study group.

In the study group, 24 patients were male and 14 were female. The average age was 65.57 years (+/- 13.32) years. Most of the patients in the study group were of sedentary activity status (23 = sedentary, 13= Medium work, 2= Heavy work). Average duration of symptoms in the study group was 19.23 months (+/- 14.74 months). The neurological symptoms, ie pertaining to nerve root involvement or spinal canal involvement were evenly distributed amongst the groups. 12 patients had purely radicular symptoms while 8 patients had pure claudication like symptoms without particular radiculopathy. 18 patients had a mixed symptomology.

Back pain on VAS score was on an average 4.05 (+/-3.05) with 23 patients having pain less than average. Back pain was the most pressing complaint in only 4 of the patients.

Decompression alone required only single level in 18 patients, while 13 patients underwent 2 levels and 5 patients underwent 3 level decompression.

The post operative back pain was average of 3.34(+/- 2.68) with 10 patients exhibiting no change in overall back pain. 8 patients documented worsening of pain while 20 patients reported mild to moderate improvement. The change in pain compared to pre-operative level was insignificant with p value of 0.0703.

Cobbs value in the patient group earlier was 17.71 degrees (+/- 6.28 degrees) and increased to 18.29 degrees (+/- 7.35). However the comparison was insignificant with p value of 0.048.

Overall 11 patients documented increase in cobbs value while 27 patients documented no increase in values. The standing Cobbs value and Nash and moe scores yielded similar results

In terms of complications, 2 patients documented reversal to previous radicular symptoms within a year. There was a single incidence of intra-operative dural tear. These were appropriately managed.

In all other patients there was no neurological deterioration and improvement in claudication and /or radicular symptoms.

## 5. Discussion

Degenerative scoliosis is a major cause of radicular pain and low back pain in the elderly, and is one of the more common indications for spinal surgery. Even though decompression surgery without fusion provides good clinical outcome neurologically, same cannot be said about the low back pain as improvement is often suboptimal [23-26]. However decompression alone might also predispose to further collapse of the curve and increasing chances of instability [27-29].

The reason proposed is that most cases normally have some instability, rotational or translational or both at the involved segments. Therefore doing a decompression alone surgery may destabilize the involved segments. Sometimes even despite the efforts to preserve posterior ligamentous complex or bilateral facet joints, instability is accelerated. Schulitz el al proposed that the risk of instability after surgery depends more on the natural history of disease than the extent of surgery [30-31].

In our study we were trying to evaluate whether decompression alone produces any further instability, deformity or increase in back pain.

Amongst our 38 patients, there was fair demographic distribution. As might be expected with the ageing population represented in our study, 36 out of 38 patients had mild to moderate activity status. The average age was 65.57 years ( +/- 13.32) years with an average symptom duration of 19.23 months. Degenerative scoliosis is well known to produce progressive radicular and claudication like symptoms which are often unresolving to medication and exercises. In this pathology, classical unilateral leg pain can occur due to foraminal nerve root compression which can be due to single or multi-level foraminal disc herniations. Even facet joint degeneration with foraminal osteophytic projections, especially from posterior wall of the intervertebral foramen can cause nerve root impingement. Bilateral leg pain, may also occur in the context of central spinal stenosis. The concept of dynamic traction across the nerve roots across the convex side is a finding which is often difficult to see radiologically. Thus the foraminal compression on the concave and traction of concave side simultaneously may provide clinical finding which is similar to one of central spinal stenosis even in its absence [32-33].

In our study, therefore we got a varied presentation which confirms to above picture. 8 patients had only claudication like symptoms while 12 patients had a single level radiculopathy which was the presenting complaint. 18 patients showed mixed etiology which as described is the hallmark of this pathology.

Back pain was the most pressing complaint in only 4 of our patients, though back pain was a common second complaint in most of the patients.

It can be well due to the fact that we did not include patients who have clinico-radiological evidence of instability in our criteria. We were strict also to exclude those patients in whom intra-operatively there was a doubt of instability at any of the levels.

The low back pain caused due to Degenerative scoliosis may be due to deformity and is ill localized at the convexity of the deformity. This form of pain is generally due to muscle fatigue and so responds to rest. This may combine with altered sagittal balance in such patients to cause pain also around lower lumbar spine and Sacroiliac joints. Spinal instability is often the other part of reason why backpain happens. However determining the cause of pain is often challenging. Lateral lysthesis, thoracolumbar kyphosis, obliquity of L3 and L4 disc plates often contribute to the causes and have been shown to be significant [34].

The back pain as measured by VAS was found to be 4.05 (+/- 3.05) with 23 patients having significant but tolerable pain. In the post operative category at the end of 1 year, there was insignificant corelation (p=0.0.0703) although there was a slight decrease in the average of low back pain (3.34 +/- 2.68). 10 patients showed no change in overall back pain. 8 patients documented worsening of pain while 20 patients reported mild to moderate improvement. The improvement can be due to resolution of the central spine decompression. However these readings are often variable and can be attributed to multiple factors.

The highlight of our study was to document the change in curvature which we monitored closely. In order to be careful we also included Cobbs angle in standing position and Nash and moe grades in addition to measuring Cobbs angle for calculating scoliosis in supine Xrays. We found Cobbs angle to be 17.71 degrees (+/- 6.28 degrees) pre-operatively which increased to 18.29 degrees (+/- 7.35) post operatively. However this increase was insignificant with p value of 0.048.

Overall 11 patients documented increase in cobbs value while

27 patients documented no increase in values. The standing Cobbs value and Nash and moe scores yielded similar results.
It is known that progressive deformity can present with superimposed leg pain and eventually leg weakness when the problem advances. Adult degenerative scoliosis with Cobb angle greater than 30 degrees; lateral listhesis of 6 mm or more; L5 depth measured from an imaginary horizontal inter-crestal line and curves with an increased apical rotational component can predict a higher than normal chance of curve progression. Acute neurological deterioration and cauda equina involvement may also occur [35-37].
When we tried to study the cases in which Cobbs value had increased we found they were also associated with a slight increase in back pain as well as less than average satisfaction in results post surgery, despite resolution of the radicular and claudication symptoms. Most of these cases had a long history and were probably refractory owing to the natural history of degenerative scoliosis in such cases.
Across our cases we had done a single level decompression in 18 cases, a 2 level decompression in 13 cases and 5 patients needed 3 level decompression. Although only 3 level decompression patients showed inability of decompression alone in providing favourable results in back pain and lumbar curvature, these were too small a sample size to comment statistically. Overall we feel that literature demands a higher data set to establish a tangible relation between these variables.

## 6. Conclusion
The results of our study do indicate that that patients of degenerative scoliosis without significant clinical or radiological evidence of instability can be treated surgically by decompression alone for their radicular symptoms and claudication. Decompression alone does not produce a significant exaggeration in deformity or increase in pain. However it also did not produce a favourable effect in these variables. Back pain improved in few patients and deteriorated in some patients, which emphasizes the need for a detailed study for evaluation of factors contributing to back pain which includes but not limited to number of levels involved, duration of symptoms and condition of facet joints. These results are in line with the works of previous authors but it also shows that we need a higher data set with a longer follow up so as to come to a tangible conclusion for management of degenerative scoliosis.

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