



## A RETROSPECTIVE AND PROSPECTIVE ANALYSIS OF THE FUNCTIONAL OUTCOME OF REVISION LUMBAR SURGERY FOR FAILED BACK SURGERY SYNDROME

### Orthopaedics

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### ABSTRACT

**Introduction:** According to literature overall success rate for revision lumbar surgery for failed back surgery syndrome (FBSS) is 12% to 82%.  
**Aim and Objective:** To retrospectively and prospectively study the functional outcome of revision lumbar surgery.  
**Methods:** This study was conducted among 33 patients with recurrent pain after index surgery and were evaluated by VAS, ODI score, neurological examination, routine radiographs, CT scans and MRI and operated targeting the cause of pain. Spinal fusion was done in 66.67%  
**Results:** The major cause of recurrent pain was instrumentation failure (45%), post-laminectomy instability (27%), and recurrent disc (27%). Mean pain free interval (PFI) was 30.95 months and mean number of previous surgeries was 1.13. Overall success rate was 69.69%. Patients with PFI of >6 months had better outcome than those with PFI <6 months.

### KEYWORDS

Failed back surgery syndrome, Spinal fusion, Revision lumbar surgery.

#### Introduction:

About 5% to 20% of patients undergoing lumbar surgeries for low back pain come with significant amount of pain after the surgery<sup>1</sup>. Among these many fall under the entity called Failed Back Surgery Syndrome (FBSS). FBSS is defined as persistent or recurrent low back pain after one or more than one lumbar surgeries and its incidence is 15%. The causes of pain are recurrent disc herniations, spinal stenosis, post-laminectomy instability, instrumentation failure, pseudo arthrosis, adjacent level degeneration, flat back syndrome, arachnoiditis and epidural scar tissue formation. As the number of spine surgeries increases, the complications following the surgeries like adjacent level degeneration after a posterior stabilisation, instability following a laminectomy, epidural fibrosis, and flat back syndrome produces further pain and disability which requires revision surgeries.

#### Materials and Methods:

This is a retrospective and prospective study conducted at our Ortho Spine Surgery Unit from December 2013 to March 2017. The patients were included in the study based on the following inclusion or exclusion criteria. Inclusion criteria included recurrent disc herniation, spinal stenosis, post-laminectomy instability, adjacent instability, pseudoarthrosis and flat back syndrome. Exclusion criteria included post-op discitis, primary disc prolapse, primary spondylolisthesis and primary canal stenosis. Patients with chronic persistent, recurrent or worsened pain following a spinal surgery were evaluated clinically and radiographically and the reasons for the recurrent pain were narrowed down. The pain may be a low back pain or radiating pain or combination of both. Persistent motor weakness and sensory deficit are not elements of failed back syndrome. Therefore, correlating the physical symptoms with the radiological findings of CT myelogram, MRI and X-ray is mandatory<sup>2</sup>.

The duration of pain free interval (PFI) is very important and the following have to be noted i) if the patient awakes with the similar complaints immediately after the surgery, it may indicate wrong level decompression, or inadequate decompression ii) if the pain recurs after 6 months it indicates recurrent disc at the same level or adjacent level degeneration iii) pain recurring in 1-6 months indicates scar tissue.

Patients having leg pain predominantly may have spinal stenosis or recurrent disc prolapse. Scar tissue also predominantly produces leg pain. Back pain suggests instability or possible scar.

Objective evaluation of patients were done by clinical examination and neurological evaluation. The patients were evaluated clinically for pain and disability by the Visual Analogue Scale and Oswestry Disability Index<sup>3</sup> scores respectively. Routine radiographs, CT scans and MRI were done to diagnose the cause of recurrent pain. Objective evaluation<sup>4</sup> also included ruling out non orthopaedic causes of pain like, pancreatitis, diabetes and abdominal aneurysm. The evaluated patients were operated targeting the cause of pain.

**Fig-01. MRI section showing scar tissue**



**Fig-02 MRI section showing scar tissue**



#### Operative technique:

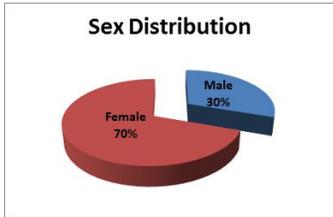
32 of our patients were operated from the posterior aspect and 1 from the anterior approach. The pedicle entry points were identified after dissecting soft tissues at the junction of inferolateral part of the facet and the mid-point of the transverse process. In case of posterolateral grafting, the transverse processes of the adjacent vertebra were decorticated and bone graft material was placed on the inter-transverse membrane. In case of instability, transforaminal lumbar interbody fusion was done in five cases and posterolateral fusion in one case. In cases of implant failure, implant exit was done first and then redo stabilization was done. In one case, the shaft of the broken screw in the vertebral body was left in situ.

#### Results:

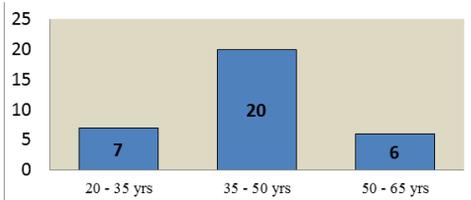
Our study had a female predominance with a mean age of 42.9 yrs. (fig:01,02). Spinal fusion was done in 66.67% of patients. Instrumentation failure (fig:03) was the commonest cause of recurrent pain (45%). Six cases (18%) had excellent outcome, seventeen (51.51%) had good outcome, seven (21.21%) had fair outcome and

three had poor outcome (9%) (fig-04). Overall success rate was 69.69% (Table:02). Longest follow up in our study was 5 years, shortest follow up of 6 months with a mean follow up of 1 years and 4 months. On comparison , Mean preoperative ODI scores was 61.3 and Mean postoperative ODI scores after 6 months was 36.3. Mean postoperative ODI scores after 9 months was 30.72 and Mean postoperative ODI scores after 12 months was 25.68. Comparing preoperative VAS and postoperative VAS score Mean preoperative VAS score was 7.8 and Mean postoperative VAS score was 4.8. Two patients had dural tear while operating for cage failure. We had four cases of infection, for which wound wash was given in two and implant exit was done in two.

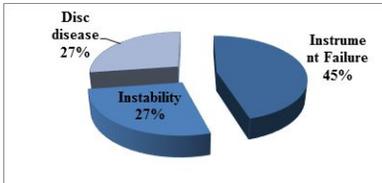
**Fig-01: Sex Distribution**



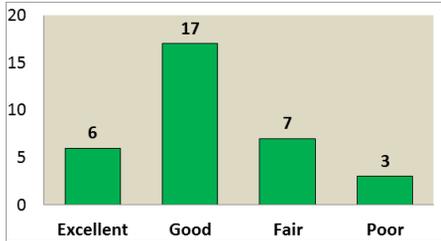
**Fig-02: Age distribution of 33 patients**



**Fig-03: Reasons for pain and failure**



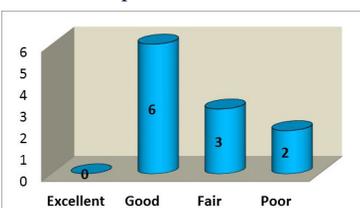
**Fig-04: Overall Outcome**



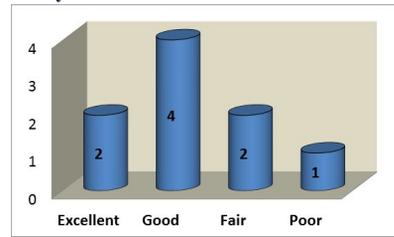
**Fig-05: Fusion Group**



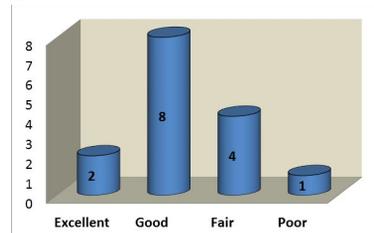
**Fig-06: Non Fusion Group**



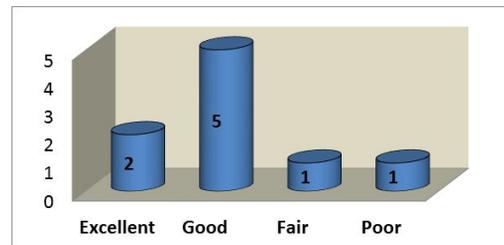
**Fig-07: Instability Cases**



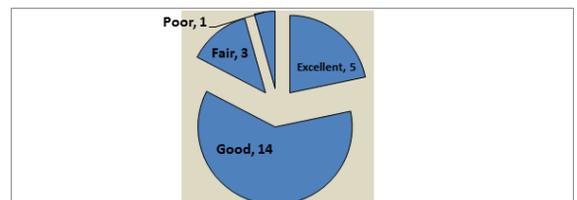
**Fig-08: Implant Failure cases**



**Fig-09: Recurrent disc cases**



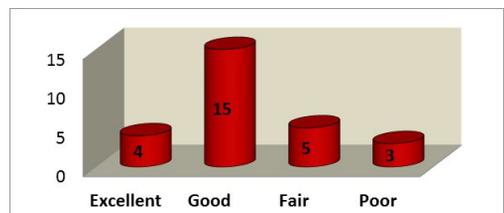
**Fig-10: Pain free interval > 6 months**



**Fig-11 Pain free interval < 6 months**



**Fig-12: Patients with 01 previous surgery**



**Table-01**

Procedure	No of cases	Procedure	Total
Posterior stabilisation & TLIF	4	Fusion Group	22
Redo Posterior stabilisation & TLIF	6		
Discectomy, Posterior stabilisation & TLIF	2		
Posterior stabilisation & Posterolateral fusion	3		

Redo Posterior stabilisation & Posterolateral fusion	6		
Anterior stabilisation & Fusion	1		
Posterior stabilisation	4	Non Fusion Group	11

Table-02

Factors	N	Success rate	Outcome		p-value
			Excellent + Good	Fair + Poor	
<b>Total</b>	33	69.69%	23	10	-
<b>Age</b>					0.294
< 35 yrs	7	85.7%	6	1	
>35 yrs	26	65.38%	17	9	
<b>Gender</b>					0.339
Male	10	80%	8	2	
Female	23	65.2%	15	8	
<b>No Previous surgery</b>					0.605
1	27	70.37%	19	8	
>1	6	66.67%	4	2	
<b>Pain free interval</b>					0.023
< 6 months	10	40%	4	6	
>6months	23	82.6%	19	4	
<b>Fusion</b>					0.174
Yes	22	77.27%	17	5	
No	11	54.54%	6	5	

### Discussion:

The outcome following revision surgery for FBSS depends on pre-evaluation, precise diagnosis, modality of treatment, pain free interval following the index surgery, number of previous operations, age, sex and finally the experience of the operating surgeon and pre-operative planning<sup>10</sup>. The successful outcome following a revision surgery for the failed back syndrome ranges from 12-82%<sup>11</sup>. The operative criteria used for the primary spine surgeries may not be applicable to revision surgeries. Stewart et al<sup>12</sup> in his study concluded that, there exists differences in the operative criteria, follow up criteria and criteria for success, thus explaining why there is difference of opinion between researchers. Thirty-two patients were operated through posterior approach and one through anterolateral approach in our study. As majority of the failed back surgery patients are approached and operated posteriorly, there may be special situations where an anterior approach and surgery may be indicated. Patients who require anterior reconstruction and augmentation to prevent failure of the posterior stabilization procedure may also be approached anteriorly. The ultimate aim of revision surgery is to achieve a pain free stable spine. The mean age of presentation in our study was 42.9 years. (range from 23-65years.) compared to the mean age of 55.4 in Chak Bor Wang et al<sup>13</sup> study. The male: female ratio in our study is 10:23. The overall success rate in our study is 69.69% which is comparable to the similar studies like the study conducted by Chak Bor Wong et al<sup>13</sup>, where the success rate was 83.9% and 72% in the study conducted by Stewart<sup>12</sup> et al. The postoperative ODI score and VAS score compared to the Preoperative ODI and VAS score, showed favorable outcome which is statistically significant. The independent factors like age, sex may affect the outcome of the revision surgeries. North et al and Stewart<sup>12</sup> et al concluded that younger patients have better outcome following revision surgery compared to the elderly age group 77-79. However, Fritsch et al<sup>11</sup> stated that there is no difference in the outcome following revision surgery based on the gender and age. In our study, younger patients (<35yrs) had very good outcome of 85.7% compared to older age group (> 35 yrs) in which the outcome was 65.38% This difference may be due to the ongoing degenerative changes in the spine as age increases or may be due to the higher compliance of the younger individuals for the postoperative rehabilitation. In our study, there is an increase in the successful outcome in male patients (80%) compared to the female patients (65.2%). The most common cause of FBSS we encountered was instrumentation failure (45%), similar to Stewart et al study and Chak Bor Wang et al<sup>13</sup> study. Waddell et al<sup>14</sup> in his study stated that probability of successful outcome decreases with the number of surgeries performed. Kim et al<sup>15</sup> showed about 66% of success for revision surgeries and 55% in re revision surgery. In our study, the average previous surgery is 1.13 compared to 1.3 in Stewart et al study. We found that patients with one previous surgery (fig:12) had better outcome, which is similar to the previous studies. The average pain free interval (PFI) in our study is 30.95 (0-156 months).

Finnegan et al<sup>16</sup> concluded that the patients with pain free interval < 12 months will have extensive fibrosis than patients with pain free interval > 12 months who may have other reasons for pain. Biondi et al<sup>17</sup> and Waddell<sup>20</sup> et al also in their studies showed that the patients with pain free interval > 6 months will have better outcome than the patients with pain free interval < 6 months. In Chak Bor Wong et al<sup>13</sup> study patients with PFI > 6 months had better results than the patients with PFI with < 6 months but there was no statistical significance in this observation. In our study too we experienced a similar result with a success rate of 82.6% in patients with PFI > 6months (fig:16) and 40% in patients with PFI < 6 months (fig:10,11) which is statistically significant with p value of 0.023. In our study, there were five patients who developed neurological deficit following the previous surgery. All five patients improved to grade 4-5 motor power in around 6 to 12 months follow up period. Overall outcome in these patients however is 40%. This is attributed probably to poor activity level following the revision surgery because of the neurological deficit. In other words, the positive outcome for the patients with no neurological deficit were successfully predicted. Although we experience a poor outcome in all these patients, there was recovery in the motor power (ASIA scale) and at long term follow up have better outcome. Kim et al<sup>15</sup> in his study revealed that the results for recurrent disc diseases were better than the stenosis patients. Finnegan et al<sup>16</sup> stated that the outcome of revision surgery is better in mechanical compression like recurrent disc disease and dynamic instability. Chak Bor Wong<sup>13</sup> also experienced a similar result with good functional outcome for recurrent disc disease(78.6%), instability(93.32%), and pseudoarthrosis (94%). We in our study also experienced a similar kind of result with a successful outcome of 66.6% in instability cases (fig 07), 77.7% in recurrent disc cases (fig 09), and 66.6% in the instrumentation failure cases (fig 08). The good functional outcome in the recurrent disc cases is mainly attributed to the spinal fusion which is achieved either through an instrumentation or through posterolateral bone grafting. The poor outcome following revision surgery for the instrumentation failure and instability cases may be attributed to the neurological deficit among two of the three patients which affects the activity level of the patient and infection in one patient, which increases the morbidity. After laminectomy and discectomy, the disc height may get reduced and produces a compressive load on the posterior elements or the radial bulge may produce nerve tissue tension. Cinnoti et al<sup>18</sup> revealed that spinal fusion is not necessary in revision surgery for recurrent disc disease. But Fritsch et al<sup>11</sup> stated that patients with spinal fusion for recurrent disease experienced a better outcome compared with the patients without fusion. The laminectomy and discectomy done in the index procedure produces instability and pain and causes continuous epidural and nerve irritation and produces epidural fibrosis. In this study, we have done fusion for 6 of the 9 instability patients of which 66.6% patients had good outcome. Out of nine recurrent disc patients fusion was done in only 2 patients, but still we obtained a good functional outcome of 77.7%. One of our patients with L5- S1 recurrent disc disease with pain free interval of 10 years had laminectomy and discectomy done. During the initial follow up period she had a better outcome but as the follow up period increased the ODI score increased indicating disability. This is due to the instability at the L5-S1 level during 48 months of follow up. Therefore, we conclude that the successful outcome in the non-fusion group may be due to the short term follow up, which needs further long term follow up to decide<sup>19</sup>. And in our study there is a significant difference between the fusion (fig:05) (77.27%) and non-fusion (fig:06)(54.54%) groups in terms of successful outcome.

### CONCLUSION:

Proper preoperative evaluation and diagnosis is of paramount importance in the management of FBSS. High success rate following revision lumbar surgery depends on good preoperative planning. Finding out the specific pathology and targeting it appropriately leads to gratifying results. Good experience and expertise in meticulous dissection prevents complications like dural tears and infections. Spinal fusion is mandatory in cases of post laminectomy instability, and recurrent disc prolapse with demonstrable instability. The experience of the operating surgeon in dealing with FBSS patients influences the final outcome. For the successful outcome of revision surgery for FBSS spinal fusion is compelling. However a long term follow up and a larger sample study is needed to further validate our findings.

### CASE ILLUSTRATIONS

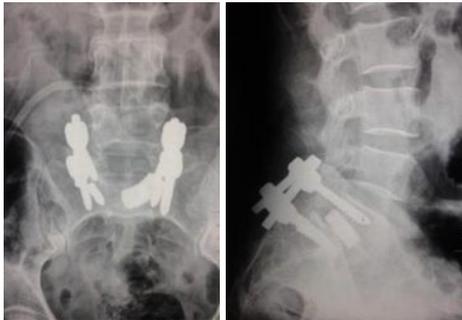
#### CASE 1

**PREOP:Broken screws in Sacrum**



45 year old patient presenting 18 months after undergoing surgery for Grade I isthmic spondylolisthesis with pain and failed spinal implants.

**POSTOP**



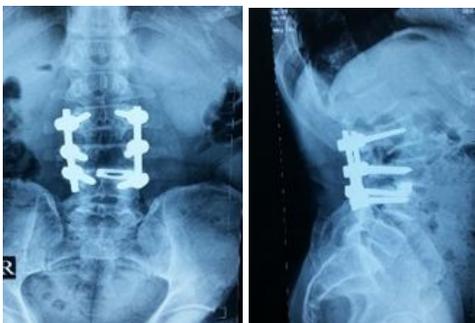
14 months after patient had undergone revision surgery in the form of redo posterior stabilisation and TLIF

**CASE 2**

**PREOP:Instrumentation failure**



**POSTOP- Posterior stabilization (TLIF)**



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