Original article

# Failed Back Syndrome: Evaluation with MRI

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**Abstract**

**Introduction:** One of a major late post operative complication of discectomy is persistent pain and radiculopathy also termed as failed back syndrome. The study aims to evaluate the MRI findings of failed back syndrome.

**Methods:** A retrospective hospital record based study among 53 patients was carried out at multimodality-imaging center associated with a tertiary care neurological center in Kathmandu, Nepal. MRI of patients performed for persistent pain after discectomy were selected for duration of 3 years and reviewed. All MRIs were performed with and without contrast enhancement. Three radiologists reported the MRIs with mutual consensus in disputed issues. All data were entered in SPSS spreadsheet and analysis was done using SPSS version 19.

**Results:** The mean age of the patients was 45.9± 16.1 years. Out of the total 53 cases, the operative site was at cervical spine in 35.8% cases, in lumbar spine in 64.2% cases and none in dorsal spine. Predominant epidural fibrosis without any other cause attributed to radiculopathy in 93.5% patients. Recurrent Disc herniation was noted in 6.5% patients whereas spondylodiscitis was seem in only one (1.9%) patient at C6-C7 level. The most common level operated in lumbar spine was L5-S1 (28.3%) followed by L4-L5 (24.5%) and in cervical spine was C4-C5 and C5-C6 contributing 17% each.

**Conclusion:** The study concluded that the common causes of failed back syndrome were epidural fibrosis, recurrent disc herniation and rarely spondylodiscitis.

**Key Words:** Failed Back Syndrome, MRI

## Introduction

Discectomy is a common surgical procedure performed to release nerve root compression in patients with disc herniation. Discectomy has evolved from classic approach to minimally invasive microdiscectomy and endoscopic discectomy. Disc herniations are also seen in asymptomatic patients and even in symptomatic patients its been noted to regress with time.[1] The superiority of non operative versus operative management has been debated in the literature, however the Spine Patient Outcomes Research Trial (SPORT) did not show any definite superiority of one versus the other.[2] Lumbar discectomy however has been shown to be effective in selected patients with sciatica. Also discectomy was seen to be superior to conservative methods in early post operative period but similar outcome later in the course of time.[3]

One of a major late post operative complications of discectomy is persistent pain and radiculopathy also termed as failed back syndrome or failed back surgery syndrome (FBSS). The impact of FBSS on an individual's quality of life and functional status are considerable and more disabling as compared to other common chronic conditions.[4] Magnetic Resonance Imaging (MRI) due to its excellent soft tissue contrast is very useful in investigating the cause of symptom. MRI with contrast enhancement is the modality of choice for evaluating persistent pain after surgery.[5] The study aims to evaluate the MRI findings of failed back syndrome.

## Methods

It was a retrospective cross sectional hospital based study conducted at multimodality-imaging center associated with a tertiary care neurological center in Kathmandu, Nepal. MRI of lumbosacral, dorsal and cervical spine performed in the center during May 2010 to May 2013 for recurrent back pain and radiculopathy after discectomy with or without laminectomy was reviewed.

MR examination done in 0.35 Tesla Siemens MRI machine (Magnetom C). For symptomatic using medium and large sized body coils with matrix of 256x75. Images were obtained in sagittal and axial planes in T1 and T2 weighted sequences. Contrast enhanced images were acquired in axial, sagittal and coronal planes. Inversion Recovery (STIR) sequence was performed in some cases for further evaluation.

Three radiologists, one with more than 10 years experience in Spinal MRI, viewed the MRI images with mutual consensus in disputed issues. Post operative infection (spondylodiscitis) was diagnosed when MRI showed enhancing disc, marrow signal change in adjacent vertebra (T1 low and T2 high) with or without enhancing soft tissue mass surrounding the adjacent vertebral level in perivertebral and epidural space. Recurrent disc herniation was diagnosed with MRI findings of central non-enhancing soft tissue (isointense to the intervertebral disc) contiguous or adjacent to the IV disc in anterior epidural space. Epidural scar was considered, when enhancing scar on anterior, lateral and posterior epidural spaces obliterated the normal epidural fat.

Informed consent was taken from each patient and none confidentialty in terms of information and identity of patient was ensured. A total of 53 patients met the inclusion criteria and were included in the study. (The imaging findings were recorded in predesigned proformal and plotted in SPSS data sheet. Statistical analysis was performed from SPSS version 19.

## Results

The mean age of the patients was 45.9± 16.1 years with median of 43 years and interquartile range of 25 years. There was clear male predominance with male to female ratio of 2.3:1.Out of the total 53, the operative site was at cervical spine in no. (35.8%) cases, in lumbar spine in no. (64.2%) cases and none in dorsal spine. Similarly, a total of 75 IV discs were operated including 46 lumbar and 29 at cervical level. Single disc surgery was done in patients 37(69.8%), two discs in 11(20.8%) and multiple (more than 2) were operated in 5(9.4%) patients as shown in Table 1.

**Table 1. Characteristics of Population**

| Characteristics | Number (percent) N=53 |
|---|---|
| **Age:** | |
| Mean | 45.9± 16.1 |
| Median | 43 (IQ -25) |
| **Sex:** | |
| Males | 37 (69.8) |
| Females | 16 (30.2) |
| **Operated Site** | |
| Cervical | 19 (35.8) |
| Lumbar | 34 (64.2) |
| **Operated IV disc** | |
| Total number of IV discs operated upon | 75 |
| Single | 37 (69.8) |
| Two | 11 (20.8) |
| Multiple | 5 (9.4) |

The most common level of disc operated in lumbar spine was L5-S1 in 15 patients (28.3%) followed by L4-L5in 13 patients (24.5%) whereas in cervical spine it was C4-C5 and C5-C6 contributing 9 patients (17%) in each as shown in Table 2 and Table3.

**Table 2. Level of IV Disc Operated in Lumbar Spine**

| Levels | Male (N=37) | | Female (N=16) | | Total (N=53) | | p-value* |
|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | |
| L1-L2 | 4 | 10.8 | 1 | 6.3 | 5 | 9.4 | 0.60 |
| L2-L3 | 3 | 8.1 | 2 | 12.5 | 5 | 9.4 | 0.62 |
| L3-L4 | 5 | 13.5 | 3 | 18.8 | 8 | 15.1 | 0.62 |
| L4-L5 | 9 | 24.3 | 4 | 25 | 13 | 24.5 | 0.96 |
| L5-S1 | 8 | 21.6 | 7 | 43.8 | 15 | 28.3 | 0.10 |

* p-value calculated using chi square test.

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**Table 3. Level of IV discs operated in cervical spine**

| Levels | Male (N=37) | | Female (N=16) | | Total (N=53) | | p-value* |
|---|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent | |
| C2-C3 | 1 | 2.7 | 1 | 6.3 | 2 | 3.8 | 0.53 |
| C3-C4 | 4 | 10.8 | 2 | 12.5 | 6 | 11.3 | 0.86 |
| C4-C5 | 8 | 21.6 | 1 | 6.3 | 9 | 17 | 0.17 |
| C5-C6 | 9 | 24.3 | 0 | 0 | 9 | 17 | Chi square- 4.69 P<0.03 ** |
| C6-C7 | 3 | 8.1 | 0 | 0 | 3 | 5.7 | 0.241 |
| C7-D1 | 0 | 0 | 0 | 0 | 0 | 0 | - |

* p-value calculated using chi square test.
**- one cell have expected count less than 5

All patients were categorized according to MRI findings as having only epidural fibrosis, recurrent disc herniation or spondylodiscitis. Some amount of epidural fibrosis was present in all cases, however cases where epidural fibrosis was the only predominant finding which could have be attributed the pain were separated from the others in which either recurrent disc herniation or spondylodiscitis was also found.
Predominant epidural fibrosis without any other cause attributable to radiculopathy was seen in 43 patients i.e. 93.5% patients. Recurrent Disc herniation was resent in 3(6.5%) patients. 2 at L5-S1 level and one at L1-L2 level as shown in Table 4. In cervical spine recurrent disc herniation was noted one at each C3-C4, C4-C5 and C5-C6 levels. Infection i.e. spondylodiscitis was noted in only one (1.9%) patient at C6-C7 level in cervical spine as shown in Table 5.

**Table 4. Distribution of pathology according to levels in lumbar spine**

| Levels | L1-L2 | | L2-L3 | | L3-L4 | | L4-L5 | | L5-S1 | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Percent | No. | Percent | No. | Percent | No. | Percent | No. | Percent | |
| Epidural Fibrosis | 4 | 80 | 5 | 100 | 8 | 100 | 13 | 100 | 13 | 86.6 | 43 (93.5%) |
| Recurrent Disc Herniation | 1 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 13.3 | 3 (6.5%) |
| Post Operative Infection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **5** | **100** | **5** | **100** | **8** | **100** | **13** | **100** | **15** | **100** | **46 (100%)** |

**Table 5. Distribution of pathology according to levels in cervical spine**

| Levels | C2-C3 | | C3-C4 | | C4-C5 | | C5-C6 | | C6-C7 | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Percent | No. | Percent | No. | Percent | No. | Percent | No. | Percent | |
| Epidural Fibrosis | 2 | 100 | 5 | 83.3 | 8 | 88.8 | 8 | 88.8 | 2 | 66.6 | 25 (86.2%) |
| Recurrent Disc Herniation | | | 1 | 16.6 | 1 | 11.1 | 1 | 11.1 | | | 3 (10.3%) |
| Post Operative Infection | | | 0 | 0 | | | | | 1 | 33.3 | 1 (3.4%) |
| **Total** | **2** | **100** | **6** | **100** | **9** | **100** | **9** | **100** | **3** | **100** | **29 (100%)** |

## Discussion

Discectomy either microscopic, endoscopic or classic techniques all have proven to be effective in treatment of disc herniation and are the most common procedure performed for disc related symptoms.[2] However patient may suffer from persistent pain and radiculopathy after discectomy, which is termed as, failed back syndrome or failed back surgery syndrome. The most common reasons are recurrent or persistent disk extrusions, postoperative scarring, spondylodiscitis, arachnoiditis, nerve root damage (neuritis), and inadequate surgery. MRI is the imaging modality of choice to detect cause of persistent or recurrent back pain in patients with herniated disc treated with surgery.[6]

The incidence of patients who will develop FBSS following lumbar spinal surgery is commonly quoted in the range of 10% to 40%.[4,7,8] There are very few demographic data for failed back syndrome because it is an artificial construct rather than a disease entity. The mean age of the patients is estimated to be 50 years.[8] The mean age of patient in our study was 46 years slightly less than previous study. Our study showed a higher proportion of male with failed back syndrome, this might probably be relate with a higher prevalence and risk of low back pain in males.[9, 10]

Our study included post discectomy cases involving the whole spine i.e. cervical and lumbar cases. The most common level operated in lumbar spine was L5-S1 followed by L4-L5, which is also consistent with the commonest level involved with degenerative disc disease and disc herniation.[11-13] In cervical spine the most common level of surgery was C4-C5 and C5-C6 levels, which are also the most common levels, involved with disc herniation in cervical spine.[14]

Some degree of epidural fibrosis is present in every case following discectomy, however the role of epidural fibrosis in pain and radiculopathy is debated. Some of the previous studies have demonstrated association between epidural fibrosis and pain and radiculopathy, where as others have debated the association of epidural fibrosis and pain.[5, 15-17] Epidural fibrosis has shown to be causal or contributory to persistent symptom in 20-36% of postoperative cases.[17-19] In our study epidural fibrosis was present in 93.5% of cases, however whether epidural fibrosis was attributable to pain or not was not established. Various psychological factors have also been noted to play a role in persistent pain after surgery in previous studies.[20, 21] The presence of epidural fibrosis alone in failed back syndrome in our study might have some psychosocial factors, which was not assessed in the study.

One of the important entity to differentiate the epidural fibrosis is from recurrent disc or residual disc herniation. Recurrent disc herniation can result in failed back syndrome in 3-18% of patients undergoing first disc surgery.[22] In our study recurrent disc herniation accounted for 6.5% of all cases of persistent back pain after discectomy. Contrast enhanced MRI demonstrates homogeneous enhancement in epidural fibrosis where as herniated disc shows central non-enhancement, which aids in differentiating these two condition. However the criteria is valid only for 6 months after surgery and early MRI may not be able to differentiate these conditions as herniated disc also tends to demonstrates homogeneous enhancement in early post operative period.[23] There was only one case of infection in our study, which occurred, in cervical spine at C6-C7 level. Disc space infection is a rare complication of spinal surgery with incidence of 0.13 to 0.9%. Early identification and treatment is necessary as they can proceed to permanent neurologic deficit. Postoperative spondylodiscitis is diagnosed on MRI with the findings of disc enhancement, marrow signal changes in adjacent vertebrae, with or without epidural and perivertebral enhancing soft tissue or collection. However disc space enhancement can also be present in early postoperative period, which should not be confused with spondylodiscitis. Also the marrow changes can be complicated by degenerative end plate changes (Modic changes) giving rise to high signal intensity in T2 and low signal intensity on T1W image.[24] In our patient there was minimal epidural collection, marrow signal change and dis space enhancement confirming the diagnosis of spondylodiscitis.

There were certain limitations of our study. The study was a retrospective study of patients undergoing MRI for failed back syndrome, which thus does not give us the incidence of failed back syndrome or any causes of failed back syndrome. Also clinical details were not assessed especially presence of radiculopathy and psychological status. Preoperative MRI was not reviewed in our study. Enhancement of nerve root was not assessed in our study.

## Conclusion

Persistent back pain and radiculopathy is a common complication after discectomy. The main causes of persistent back pain post discectomy were epidural fibrosis, recurrent disc herniation and rarely spondylodiscitis.

## Conflict of interest: None declared

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