



## Functional outcome of surgical management of degenerative lumbar canal stenosis using Japanese orthopedic association score (JOA)

### KEYWORDS

lumbar canal stenosis, Japanese orthopedic association score, recovery rate

#### Dr. Ashish Sharma

Resident, Bharati Hospital and Research Center, Pune,

#### Dr. Sanjay Patil

Professor & Head, Bharati Hospital and Research Center, Pune

#### Dr. Mohit Gupta

Resident, Bharati Hospital and Research Center, Pune

### ABSTRACT

**Objective:** To determine the functional outcome after surgical management of degenerative lumbar canal stenosis.

**Method:** In the present study 20 patients of degenerative lumbar canal stenosis were enrolled. All the Patients were managed with three different surgical techniques according to preformulated indications. JOA scoring system for low backache was used to assess the patients. The recovery rate was calculated as reported by Hirabayashi et al. (1981). Surgical outcome was assessed on the recovery rate and was classified using a four grade scale: Excellent, improvement of >90%; good, 75–89% improvement; fair, 50–74% improvement; and poor, below 49% improvement. The patients were evaluated post-op at 3 months, 6 month and one year follow-up.

**Results:** 55% patients in the study were having JOA scores less than 19 preoperatively. On post operative 3rd month 75% patients had scores 20 and above whereas on post operative 6th month, the proportion was increased to 95%. On post operative one year no patient had scores less than 20. Total 55% patients were having good functional outcome whereas 5% had excellent outcome. Fair outcome was observed in 35% patients and poor in 5% patients.

**Conclusion:** Surgical treatment in patients of degenerative lumbar canal stenosis yields excellent results as observed on the basis of JOA scoring system.

### INTRODUCTION

Low backache is a major public health problem in the rural areas. It causes suffering and distress to patients and their families, and affects a large number of people. As its distribution is worldwide in nature, it eats away many valuable work hours of the individual and also directly or indirectly places an enormous economic burden on the society.

In degenerative lumbar canal stenosis, spinal canal narrows and leads to compression on the spinal cord and nerve roots. Symptoms include low back pain, neurological claudication and neurological deficit.

Prolapse intervertebral disc occurs in about 5-10% of all low backache patients and is a common cause of sciatica. Disc prolapse alters the disc height and mechanics of the rest of the spinal column, possibly adversely affecting the behavior of other spinal structures such as muscles and ligaments. The standard treatment of prolapsed lumbar disc has been surgical excision of the disc or conservative treatment, though the methods vary.

The first disc prolapse operation falsely accredited to Mixer and Barr was conducted by Oppenheim and Krause in Berlin but it was interpreted as an enchondroma of spinal disc. Mixer and Barr's classical paper "Rupture of intervertebral disc with involvement of spinal canal" opened an era of systematic diagnosis and operative treatment of lumbar disc prolapse. Their approach showed the effectiveness of Laminectomy and Discectomy in its management and since then there has been an ever increasing enthusiasm to solve sciatica problems surgically by disc excision. Although minimally invasive operations such as percutaneous nucleotomy<sup>2,3</sup> and microendoscopic<sup>4</sup> discectomy have gained attention in recent years, standard discectomy is still the preferred management technique among the majority of surgeons, and its favorable outcomes and af-

fordability have been reported.<sup>5</sup>

Other mode of treatment, "active" nonoperative treatment is also used, except in patients with progressive neurologic deficit and cauda equina syndrome, both of which are indications for urgent decompression<sup>6</sup>. Hence any surgical intervention without appropriate conservative therapy leads to unnecessary surgery and also a poor outcome.<sup>7</sup>

With the basic understanding of disease process, new diagnostic techniques, refinements in conservative treatment and discectomy, improvements in surgical instrumentation revealed that surgical removal of the offending disc herniation is reasonably safe procedure with satisfactory results. Mortality of this surgery is almost negligible. Thus the present study was undertaken to study the functional outcome of the surgical management of degenerative lumbar canal stenosis.

### JOA SCORE

1) Low Back Pain		
a	None	3
b	Occasional, mild	2
c	Frequent mild or occasional severe	1
d	Frequent, severe	0
2) Leg Pain		
a	None	3
b	Occasional mild leg pain or numbness	2
c	Frequent mild or occasional severe leg Pain or numbness	1
d	Frequent severe leg pain or numbness	0
3) Gait		
a	Normal	3
b	Able to walk >500 m with leg pain or numbness	2
c	Able to walk for 100- 500 m	1
d	Unable to walk > 100m	0

4) Straight Leg Raising Test		
a	Normal	2
b	30-70°	1
c	< 30°	0
5) Sensory Deficit		
a	Normal	2
b	Slight disturbance	1
c	Severe disturbance	0
6) Motor Deficit		
a	Normal	2
b	Motor power > grade III	1
c	Motor power <= grade III	0
7) Turn Over While Lying		
a	Easy	2
b	Difficult	1
c	Impossible	0
8) Standing Up		
a	Easy	2
b	Difficult	1
c	Impossible	0
9) Washing Face		
a	Easy	2
b	Difficult	1
c	Impossible	0
10) Leaning Forward		
a	Easy	2
b	Difficult	1
c	Impossible	0
11) Sitting About 1 Hour		
a	Easy	2
b	Difficult	1
c	Impossible	0
12) Lifting Heavy Weight		
a	Easy	2
b	Difficult	1
c	Impossible	0
13) Running		
a	Easy	2
b	Difficult	1
c	Impossible	0
Maximum JOA score		29
Minimum JOA score		0

**Material and Methods:** The present study was conducted during July 2013 to Feb 2014. Total 20 patients of degenerative lumbar canal stenosis were enrolled in the study using following inclusion and exclusion criteria.

**Inclusion criteria:**

- Patients aged 50-70 years with degenerative lumbar canal stenosis.
- Neurological claudication distance less than 500m.

**Exclusion criteria:**

- Post traumatic canal stenosis.
- Lumbar canal stenosis due to tumors and infections.
- Patients not willing to participate in the study.

Detailed history, a complete clinical examination and routine investigations were done in all the patients and were recorded on a prestructured proforma. X-ray was taken in all patients pre-operatively and post-operatively where as MRI was done pre-operatively.

Patients were managed with three different surgical techniques according to preformulated indications. Laminectomy with Discectomy, Laminectomy with Discectomy with Posterior spinal fusion or Laminectomy with Discectomy with Posterior Instrumentation, Interbody cage. All the

patients were followed for one year at fixed interval (3 months, 6months and 1 year) to study the outcome.

Pre and post operative assessment of the patients was done according to JOA evaluation system for low back pain. The JOA score was determined by direct questions to evaluate symptoms, signs, and restriction of daily living activities. The recovery rate was calculated as reported by Hirabayashi et al. <sup>8</sup>

Recovery rate (%) = (Postoperative score – Preoperative score)/ (29 – Preoperative score)×100.

Rate of Recovery was classified as: Excellent, >90%; good, 75–89%; fair, 50–74%; and poor, below 49%.

**RESULTS:**

**Table 1: Distribution of patients according to various characteristics**

Variable		No. (n=20)	%
<b>Age</b>	≤ 50 yrs	3	15
	51 – 55 yrs	4	20
	56 - 60 yrs	4	20
	61 - 65 yrs	6	30
	66 - 70 yrs	3	15
<b>Sex</b>	Female	8	40
	Male	12	60
<b>Claudication distance Procedure</b>	<100 m	7	35
	101 -200m	6	30
	201- 300m	4	20
	301 - 400m	3	15
	Laminectomy with Discectomy	5	25
	Laminectomy with Discectomy with Posterior spinal fusion	13	65
Laminectomy with Discectomy with Posterior Instrumentation with Interbody cage Fixation	2	10	

It was observed that majority of the patients were more than 60 years old (45%). And it has male predominance (60%). 35% patients were having Claudication distance less than 100meters.

Laminectomy with Discectomy with Posterior spinal fusion was performed in 65% cases and it was followed by Laminectomy with Discectomy in 25% patients.

**Table 2: Distribution of patients according to JOA scores**

Score	Pre operative	Post operative		
		3 month	6 month	1 year
10-14	1 (5%)	1 (5%)	0	0
15-19	10 (50%)	4 (20%)	1 (5%)	0
20-24	9 (45%)	14 (70%)	9 (45%)	3 (15%)
25-29	0	1 (5%)	10 (50%)	17 (85%)

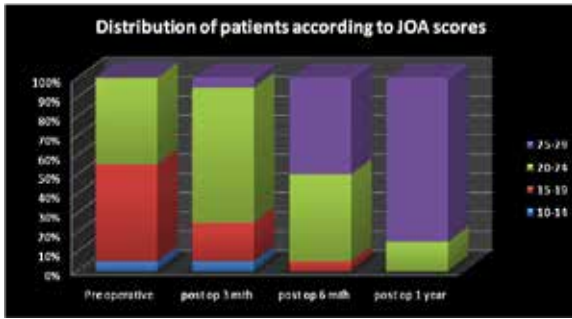
It was seen that majority of the patients (55%) in the study were having JOA scores less than 19 preoperatively. On post operative 3<sup>rd</sup> month 75% patients were having scores 20 and above whereas on post operative 6<sup>th</sup> month proportion was increased to 95%. On post operative one year no patient was having scores less than 20.

**Table 3: Outcome according to Recovery rate**

Outcome	No (n=20)	%
Excellent	1	5
Good	11	55
Fair	7	35
Poor	1	5

Outcome of the surgical procedure was calculated by using the recovery rate. It was observed that 55% patients were having good functional outcome whereas 5% were having excellent outcome. Fair outcome was observed in 35% patients and poor in 5% patients.

**Chart 1: Distribution of patients according to JOA scores**



**Chart 2: Outcome according to Recovery rate**



**DISCUSSION:**

The present study was undertaken to study the functional outcome of surgical management of degenerative lumbar canal stenosis. Japanese orthopedic association score (JOA) was used to measure the functional outcome. It was observed that majority of the patients in the study were more than 60 years old (45%). Similar findings were also reported by Rajendra Nath<sup>9</sup> and Porter RW<sup>10</sup>. Majority of our patient population comprised of males which were in accordance with studies by Weber et al<sup>11</sup>, Spengler et al<sup>5</sup> and Davis et al<sup>12</sup>.

It was also observed that 35% patients were having Claudication distance less than 100meters. Majority of cases came with complaints of low backache and radicular pain. The duration of symptoms varied from 1 month to 5 years. Most of patients had a positive SLRT along with neurological deficit & paraspinal spasm. Laminectomy with Discectomy with Posterior spinal fusion was the most commonly (65%) performed procedure.

55% patients in the study were having JOA scores less than 19 preoperatively. Improvement in the JOA score was observed postoperatively. And after one year of surgery no patient was having scores less than 20.

The formula of recovery rate was used to calculate the functional outcome of the surgery. 55% of patients were having good functional outcome and 5% were having ex-

cellent outcome. Fair outcome was observed in 35% patients and poor in 5% patients.

Ganz et al<sup>13</sup> (1990) reported almost similar result showing 86% good outcome in their series of 33 patients treated by decompressive surgery. Weinstein et al<sup>14</sup> (2010) showed that patients with degenerative spondylolisthesis and spinal stenosis treated surgically showed substantially greater improvement in pain and function during a period of 2 years than those treated nonsurgically.

Weber et al<sup>11</sup> and Spengler DM et al<sup>15</sup> also reported higher proportion of good and excellent outcome in surgically treated groups.

Thus we could say that operative treatment in patients of degenerative lumbar canal stenosis yields excellent long term functional results as observed on the basis of JOA scoring system provided that patients are properly selected and decompressive surgery is performed simultaneously addressing the associated instability or listhesis. Majority of the activities of daily living which were assessed using JOA score showed significant improvement.

**CONCLUSION:**

With reference to the above mentioned results and discussion we could conclude that Operative treatment in patients of degenerative lumbar canal stenosis yields excellent results as observed on the basis of JOA scoring system.

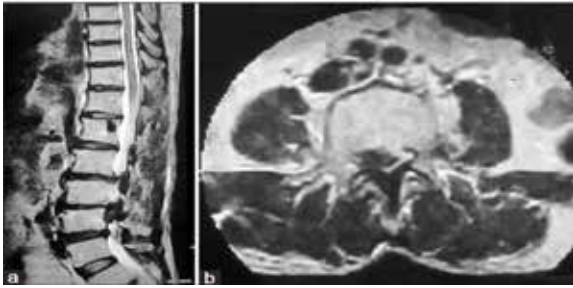
**Fig.1:** (a) Preoperative AP and (b) Lateral X-rays of patient with secondary degenerative LCS at L3-4, L4-5 with retrolisthesis of L4 over L5



**Fig 2: MRI showing L5-S1 disc prolapse**



**Fig 3:** (a) Preoperative T2 sagittal MRI section showing degenerative LCS L3-4, L4-5 with degenerated disc at L2-3, L3-4, L4-5. (b) Preoperative T2 axial MRI section showing large herniated disc at L3-4



**Fig 4:** (a) Pre-op x-rays (b) Post-op x-rays



**Fig 5:** (a) Pre-op x-rays (b) Post-op x-rays



**Fig 6:** Intra-operative Picture



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