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Research Paper

Study Of Posterior Decompression Of Lumbar Spine Canal Stenosis By Spinous Process Osteotomy Approach

Medical Science

KEYWORDS : lumbar spine, lumbar canal stenosis, spinous process osteotomy

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ABSTRACT

Aim- To evaluate the results of procedure of SPINOUS PROCESS OSTEOTOMY(SPO) in posterior decompression of lumbar spine canal stenosis in terms of (1) Outcomes including neuro-recovery, symptomatology and function (2) Safety including occurrence and rate of complications (3) Radiographically maintenance of stability and alignment in affected and adjacent motion segments | Material and methods- study of 25 patients of Civil Hospital Ahmedabad of age range 30-60yrs. In all procedure was SPO+fenestration+foraminotomy with discectomy/laminotomy in some cases. Assessment of results with standard outcome measures was carried out through standard Performa. | Results- All except one patient had neurological and syptomatological recovery with minimum follow up of 2yr. All patients had SPO, fenestration and foraminotomy and additionally 3 underwent laminotomy and 14 discectomy. 1 poor result was due to intra op nerve root injury with associated adherent hard disc. | Conclusions- Technique is associated with minimal muscle injury, effective , faster and long lasting decompression, and satisfactory neurological and functional outcomes with acceptable low risk of complication, highly safe with maintenance of spinal stability. |

INTRODUCTION

Lumbar spinal canal stenosis is one manifestation of the general process of spinal degeneration that occurs with aging, and often becomes symptomatic in the fifth and sixth decades of life. Unfortunately, lumbar spinal stenosis continues to be misunderstood and under-diagnosed, and many patients are never offered effective treatment for their symptoms. The symptoms of lumbar stenosis are of two types, and both can be present in the same patient:

1. Neurogenic Claudication (unilateral/bilateral) due to central canal narrowing
2. Radicular symptoms due to narrowing of the vertebral foramen

The diagnosis can be more difficult due to the frequent coexistence of other disease processes in this age group, such as degenerative arthritis of the spine, hip or knee, vascular claudication, peripheral neuropathy, and de-conditioning of spinal musculature and ligaments. Although the diagnosis can be strongly suspected from the history and physical findings alone in many cases, non-contrast stress MRI now provides a confirmation in many cases, and now routine myelography is no longer necessary. For patients who are persistently symptomatic despite adequate conservative care, surgery can offer a highly rewarding and effective for improvement in quality of life.

Spinous Process Osteotomy – Technique for Lumbar decompression in lumbar canal stenosis described by Weiner BK, Fraser RD. Peterson M in 1999. Source from Northeastern Ohio Universities College of Medicine, USA. With Objective, To describe a technique that affords a wide exposure for decompression while minimizing damage to surrounding tissues, and to analyze the outcomes formally using the technique.

AIM AND OBJECTIVES

Commonly used techniques of lumbar decompression, which include bilateral takedown of paraspinal musculature and aggressive bony resection can result in significant iatrogenic instability and subsequent problem of exaggerated back pain and restenosis , whereas minimally invasive techniques like endoscopic procedure often provide inadequate visualization and/or decompression and involve costly instrumentation and time consuming. [9]

If it is fixed lysthesis with predominant symptom of LCS, we have to consider of minimal traumatic technique to prevent surgical iatrogenic instability

So, the aim of the study was to evaluate the suitability of this new procedure of SPINOUS PROCESS OSTEOTOMY in the posterior decompression of lumbar canal stenosis in terms of-

1. Outcomes in terms of neurological recovery, symptomatology and functional outcome
2. Safety in terms of occurrence and rate of complications
3. Radiographically in terms of satisfactory decompression and maintenance of stability in affected and adjacent motion segments. Maintenance of alignment in saggital and coronal plane
4. Ease of procedure for surgeon, anesthetist and patient and satisfactory decompression within reasonable surgical time.

MATERIALS AND METHODS

This is a study of 25 patients with lumbar canal stenosis carried out for approximately three years in Orthopaedic Unit , Civil Hospital Ahmedabad. A complete clinical examination, imaging studies, surgical management and follow up with assessment of result of patients with standard outcome measures is carried out through a standard Proforma.

Elderly patients (more than 70 years of age) with higher anesthetic risks or severe medical co morbidities, such as congestive heart failure, renal failure, liver cirrhosis, coagulopathy, and others, were excluded, as were patients with lumbar spondylolisthesis with instability requiring additional instrumentation.

Study included Patients with,

a. Degenerative lumbar canal stenosis either single level or multi level
b. Lumbar canal stenosis associated with low grade non mobile single level degenerative lysthesis
c. Canal stenosis associated with single level/multi level degenerative scoliosis with stable spine
d. Massive central disc prolapse with central stenosis with bilateral symptoms and/or cauda equine paresis
e. Recurrent disc herniation

Patient is assessed pre-operatively and post-operatively by us-

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ing VAS Pain scale for back and leg pain, Disability (quality of life or working capacity) in terms of LINS scale , Japanese Orthopaedic Association Scale(JOAS) and radiographic assessment of stability on non-erect dynamic lumbo-sacral lateral x-rays.

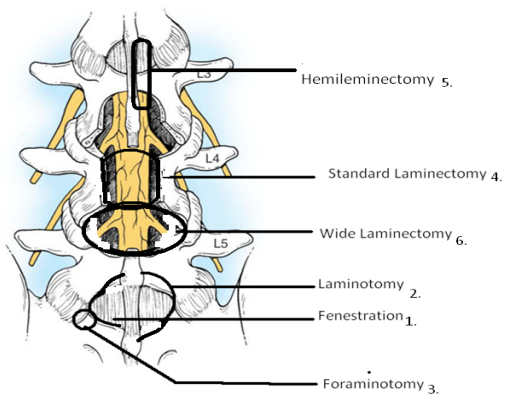
SURGICAL PROCEDURE

Steps of Spinous Process osteotomy (as given in Campbell Book Of Operative Orthopaedics, 11th edition,page 2284, described by Weiner et al.)

Our Modification

1. Complete laminectomy not done in any case.
2. We don't resect upper and lower half of lamina but fenestration, foraminotomy sos laminotomy unilateral or bilateral done on patient's clinical and imaging problem.
3. Depending on preop clinical picture like predominant side of symptom and preop imaging take down of same side paraspinal muscle followed by osteotomy of spinous process done at 1,2,3 level as in Figure 1..

Figure 1



Patient Assessment: at follow up Neurological and functional status was evaluated preoperatively and 15th day, 6 weeks, 3 ,6 and 9 Month postoperatively using the JOAS, VAS, neurology scoring system.The employment and functional status results at final follow up were evaluated using the LINS scale.Postoperative back and leg pain was also evaluated at final using a VAS scale.

For the purpose of checking the stability of the spine and to rule out iatrogenic instability post-operatively, we took dynamic lateral view in all patients at least once up to final follow up and MRI was done in some cases.

The follow-up period ranged from 2 months to 2 years who underwent SPO operation.

Final outcome is assessed using LINS Functional Ability Criteria, VAS scale for back pain and leg pain, JOAS score and radiological criteria for stability.

Observations and Results

Table 1: Age Incidence

Age Group	No. of Patients	%
31-40 yrs	9	36
41-50 yrs	11	44
51-60 yrs	5	20
Total	25	100

Table2: Sex Incidence

Sex	No. of Cases	Percentage
Male	12	48
Female	13	52
Total	25	100

Table 3: Type and level of pathology

Pathology	Associated			
	Degenerative LCS	Stable Lysthesis	Associated PID	Stable Degenerative Scoliosis
Single level	5	6	13	0
Double level	14	0	1	2
Triple Level	6	0	0	1
Total	25	5	14	3

Table 4 : Occupational Incidence

Type	No. of Patients	%
Army Person	2	8
Labourer	8	32
Sedentary Job	2	8
Housewife	13	52

Table 5: Presenting symptoms

Symptoms	No of patients	%
Motor weakness	10	40
Associated Sensory Hypoaesthesia	10	40
Cauda Equina Syndrome with Sphincter involvement	1	4
Claudiaction with Unilateral radiculopathy	9	36
Claudication with Bilateral Radiculopathy	16	64

Table 6: Management Procedures

Procedure (SPO + Fenestration + Foraminotomy±)	Numbers	%
Discectomy	14	56
Laminotomy	3	12

Table 9: Duration

	Average	Range
Surgery Time	73.40 minutes	60-100 minutes
Anaesthesia Time	92.40 minutes	90-140 minutes
Blood loss	180ml	100-300ml

Table 10: Complications

Dural Puncture	4	16%
Nerve Root Injury	1	4%
Delayed Infection	1	4%

Table 11: Neurological Recovery

In our study, out of 25 patients, 10 patients who initially pre-

sented with motor weakness, 8 patients showed full neurological recovery at final follow-up. 1 patient with 3 level problems has partial recovery at final follow up of 3 months, while 1 patient had same motor neurological status at final follow-up but show improvement in sensation with normal sphincter.

A patient present with cauda equine paraparesis with bilateral motor weakness, sensory and sphincter involvement of 5 days, recovered completely after 3 month follow up.

Table 12: Functional assessment as per LINS criteria

Result	Pre-op	%	Post-op	%
Excellent	0	0	14	56
Good	0	4	9	36
Fair	12	48	1	4
Poor	13	48	1	4
Total	25	100	25	100

After treatment at final follow-up; only 1 patient was in 'POOR' Category as per LINS criteria which is due to intra op nerve root injury during removal of adherent disc. Out of pre op 'POOR' 13 patients ,6 patients become Excellent and 6 Good at final follow up. Out of pre op FAIR 12 patients , 8 become excellent 4 GOOD at final follow up. Satisfactory results (Percentage of patients in Excellent and Good Class) were achieved in 90% of the patients.

Table 13: RESULTS : JOAS and VAS

Criteri-a	Pre-op Averag-e	Final Follow up Averag-e	Improvemen-t
Back Pain VAS	6.48	2.56	60%
Leg Pain VAS	8.36	2.00	76%
JOAS	5.12	12.56	72%

Table 14: Functional assessment as per JOAS criteria: (Recovery Rate- Hirabayashi Method)

Result	Recovery Rate	No. of patient	%
Excellent	>70%	13	56
Good	45-69%	10	36
Fair	25-44%	1	4
Poor	<25%	1	4
Total		25	100

In accordance with JOAS, according to Hirabayashi method, 12 patients had 'Excellent' results (JOAS recovery rate >70%); and 10 patients had 'Good' results (JOAS recovery rate between 45% and 70%).

Table 16: Comparison of results of SPO with Other Series

Result	Our seri-es (SPO)	Weiner BK, Fraser RD, Peterson M. (SPO) 46 patients	D.Y Cho- Conventio-nal Laminectomy 30 patients
Leg Pain Relief	70%	50%	41%
JOAS Improvement	72%	-	48%
Satisfactory recovery Rate*	90%	83%	60%

CONCLUSIONS

This technique appears to result in satisfactory spinal decompression with advantages of

- Minimal muscle trauma and post op discomfort
- Satisfactory and fast decompression with conventional instruments.
- Maintenance of spinal stability
- Early mobilization,
- Shortening of post op hospital stay
- Satisfactory functional and neurological recovery
- Reduction of postoperative back pain
- Safety and ease of procedures for al concerned

After 2 year of follow up, satisfactory neurological outcome and recovery shall be achieved without sequel of iatrogenic instability. There is no disadvantage of this procedure except perception of new approach and initial careful orientation curve.

The technique affords excellent visualization and a wide area available for Kerrison use and angulation .

It minimizes destruction to tissues not directly involved in the pathologic process, including the paraspinal musculature as well as the interspinous/supraspinous ligament complex and facets and even maintaining their stabilization properties.

Additionally, with limited skin incision length, it minimizes dead space and improves the cosmetic result to great extent without compromise of safety on patient view point.

On follow-up dynamic x-rays, aggravation of instability has not been found in any case despite its use in non mobile low grade degenerative lythesis /scoliosis other than routine deg. LCS of wide varieties of presentation and extensive involvement.

It provides better postoperative stability compared to the conventional laminectomy.

Surgeon should perceive the method as satisfactory decompression along with combination of fenestration sos discectomy/ laminotomy and foraminotomy as required without the fear of osteotomy or resultant non-union of spinous process.

The procedure can be completed in similar time or much faster as compared to routine laminectomy decompression procedure with anaesthesia time and risk lesser than endoscopic or minimal invasive time consuming method .

Most important on surgeon's view point on our set-up that this procedure can be done fast and satisfactory with routine instrumentation ,avoiding need of costly and specialized fixation instrumentation, gadgets or endoscopic system with results at par with all other such methods.

Although the spinal canal diameter and cross-sectional area are not absolutely correlated with clinical symptoms and signs, effective, safe and long lasting nerve decompression is always necessary for good outcomes.

The Spinous Process Osteotomy technique is one of the surgeries associated with minimal muscle injury, effective and faster long lasting decompression, and satisfactory neurological and functional outcomes with acceptable low risk of complication highly safe for all concerned and maintenance of spinal stability by utilizing standard outcome measures with logical expectation to maintain excellent to good results at long term follow up.

CASE REPORT

NAME : Lalitaben

- Pre-operative Status: Severe backache with claudication left lower limb since 1 year . Left LL radiculopathy with Left ankle Foot weakness (L4-L5, S1) with left sensory hypoaesthesia
- Pre-op MRI: L3-L4, L4-L5, L5-S1 canal stenosis with L4-L5 disc left side
- Surgery: Left sided L4, L5 spinous process osteotomy with L4-L5 discectomy with 3 level decompression and forami-

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notomy

- Post-operative status: At 2month follow-up: No backache , No radiculopathy , Weakness completely recovered , No Claudication with full range of movement of spine.
- Pre op SLR : 30 degrees
- Post op SLR : 80 degrees

PRE OP Radiology: (Images Below)







Post Op Radiology: (Images Below)





Post Operative Patient Clinically : (Images below)





ABBREVIATIONS:

LCS –	LUMBER CANAL STENOSIS
SPO-	SPINOUS PROCESS OSTEOTOMY
PID -	PROLAPSED INTERVERTEVRAL DISC.
UL -	UNILATERAL
BL -	BILATERAL
JOAS-	JAPANESE OPTHOPAEDIC ASSOCIATION SCALE
VAS-	VISUAL ANALOG PAIN SCALE
SLR-	STRAIGHT LEG RAISING TEST
OP-	OPERATED

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