Original Research Article

Clinical profile of degenerative lumbar spinal canal stenosis and its outcome after surgical management

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Abstract

Introduction: Degenerative spinal stenosis is a progressive disorder that involves the entire spinal motion segment as described by Kirkaldy-Willis. With this a study was conducted to assess the degenerative lumbar spinal canal stenosis which is managed by laminectomy, decompression and to assess the results of decompression. **Materials and Methods:** Study was conducted in the department of orthopedics, GSL Medical College. Patients having low back pain and radiating pain to lower limbs. After preparation of surgical area thorough scrubbing, painting and draping was done. To improve hemostasis through local anesthesia 0.5% xylocaine with epinephrine was injected in operative area. Skin was incised thorough midline incision. Electrocautery was used to dissect down to the level of spinous process. Self retaining retractor was then placed within the wound. Once the levels were identified ankobbsis was used to retract the para-spinous muscular attachments to the bone. $P<$ 0.05 was considered statistically significant. **Results:** Total 50 patients were included in this study. When post operative walking distance was considered, 10% patients were able to walk < 50 feet, 56% walked 50 feet to 2 block and 34% could walk 2 blocks to 2 miles. Excellent SSSS end results were observed in 78% participants, 16% reported good results and poor results in 8% cases. **Conclusion:** Surgical decompression of laminectomy gives good outcome in degenerative lumbar spinal stenosis and there was excellent improvement of patients after surgery.

Keywords: Stenosis**,** Surgery, Laminectomy

Introduction

Majority of individuals will experience some degree of low back pain during their lives, fortunately the condition is self-limiting patients, who continue to suffer chronic low back pain, a plethora of potential treatments exist [1]. Degenerative spinal stenosis is a progressive disorder that involves the entire spinal motion segment as described by Kirkaldy-Willis [2].

Degeneration of the intervertebral disc results in initial relative instability and hypermobility of the facet joints.

An increase in pressure on the facet joints with disc space narrowing and increasing angles of extension occurs and can lead to hypertrophy of the facet joint, particularly the superior articular process. As joint destruction progresses, the hypertrophic process ultimately may result in local ankylosis. Calcification and hypertrophy of the ligament umflavum commonly are contributing factors.

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The end result is anatomically reduced spinal canal dimensions and compression of the neural elements. The resultant venous congestion and hypertension likely are responsible for the symptom-complex known as intermittent neurogenic claudication. The management of degenerative lumbar spinal stenosis focuses primarily on non-operative modalities such as physiotherapy, NSAIDS. But surgical intervention may be indicated in selective cases.

Though low back pain may be caused by wide spectrum of conditions, specific etiology cannot be firmly established in the majority of patients. Our understanding of pathophysiology and current level of diagnostic sophistication are sufficient to determine convincingly the pathoanatomic etiology in most cases of low back pain. The availability of noninvasive techniques like MRI and CT-Myelo lumbar spinal stenosis is increasingly recognized as a cause of low back pain and radiculopathy in elderly patients. The main goal of surgical treatment of degenerative lumbar canal stenosis is decompression of

canal and relieving pressure on cauda equine and nerve roots. With this a study was planned to assess the degenerative lumbar spinal canal stenosis which is managed by laminectomy, decompression and to assess the results of decompression. Operative intervention should be expected to give good relief of claudicating pain with variable response to back pain.

Materials and Methods

Settings: Study was conducted in the department of orthopedics, GSL Medical College.

Consent: informed written consent was taken from the study participants.

Inclusion criteria: Patients having low back pain and radiating pain to lower limbs, with low back pain who failed with conservative management and lumbar spinal canal of 10 mm or less with motor and sensory deficits were included in the study.

Exclusion criteria: Patients with isolated disc herniation, previous lumbar surgeries, with space occupying lesions in spine, spinal deformities, spinal infections, with primary lumbar spinal stenosis were not included in the study.

Methods: Patients were clinically evaluated for signs and symptoms of degenerative lumbar spinal stenosis for the parameters low back pain, leg pain, activities of daily living by standard questionnaire of swiss spinal stenosis score. The questionnaire was asked to patients for subjective and objective assessment to the patients.

All the patients were evaluated with plain radiography of lumbar spine antero-posterior and lateral view and MRI lumbo-sacral spine for actual measurements of mid sagittal diameter of spinal canal, ligamentum hypertrophy, facetal joint arthropathy and pedicular abnormalities etc., In relation to associated central canal stenosis. Lateral recess stenosis, foraminal stenosis and far out stenosis.

Routine investigations such as viral screening was done to rule out infection and other pathological conditions. All patients were given general anesthesia. Patients were positioned in prone position over pillows or spinal frame in order to reduce epidural bleeding. After preparation of surgical area thorough scrubbing, painting and draping was done. To improve hemostasis through local anesthesia 0.5% xylocaine with epinephrine was injected in operative area. Skin was incised thorough midline incision. Electro cautery was used to dissect down to the level of spinous process.

Self retaining retractor was then placed within the wound. Once the levels were identified ankobbsis was used to retract the para-spinous muscular attachments to the bone. After confirming the levels to be decompressed, interspinous ligament was removed from the inferior most and superior most spinous process using a laksallrongeur.

The decompression of neural canal was then divided into three stages. Decompression of central canal which was accomplished by a high-speed burr to make the laminae thin. Then Kerrson was used to remove laminae from central canalinacaudal to cephaloid direction.

Then decompression of lateral nerves was continued till the pedicle and ligament umflavum was excised carefully; finally decompression of individual foramina nerve roots were identified and Kerrison Ronguer was placed dorsal to nerve root.

Copious irrigation was used in the wound atthispoint. Hemostasis was obtained using collagen sponge or bipolar cautery. Prophylactic antibiotics (cefaperazone+sulbactum 1.5g) were given 12 hourly for 5 days with analgesics, if required.

All the patients were rehabilitated postoperatively. Abdominal muscle exercises were advised and after 12 hours after surgery. On the third day active SLR according to the tolerance of pain and ambulation with support of walker around the bed; Ambulation without support and spinal flexion exercises along with support of LS Corset belt on day seven and if the wound was dry and health, suture were removed on day ten.

Subsequently patients were followed at 1, 3rd and 6th months for improvement clinical improvement of pain and activity of daily living. At the end of six months the final results were documented using swiss spinal stenosis score (SSS).

Statistical analysis was performed by using MS Excel-2007 and SPSS software trial version 20.0; $P< 0.05$ was considered statistically significant.

IEC approval: Study protocol was approved by the institutional ethics committee.

Results

Totally 50 patients were included in this study; mean age was 59.18 years, ranged between 45 to 73 years (Table 1); 28 male and 22 female participants (Figure 1).

Table-1: Age wise distribution of the study participants; n (%).

Age	Participants
40-44	04 (8)
50-59	25 (50)
60-69	15 (30)
70-79	06 (12)
Total	**50 (100)**

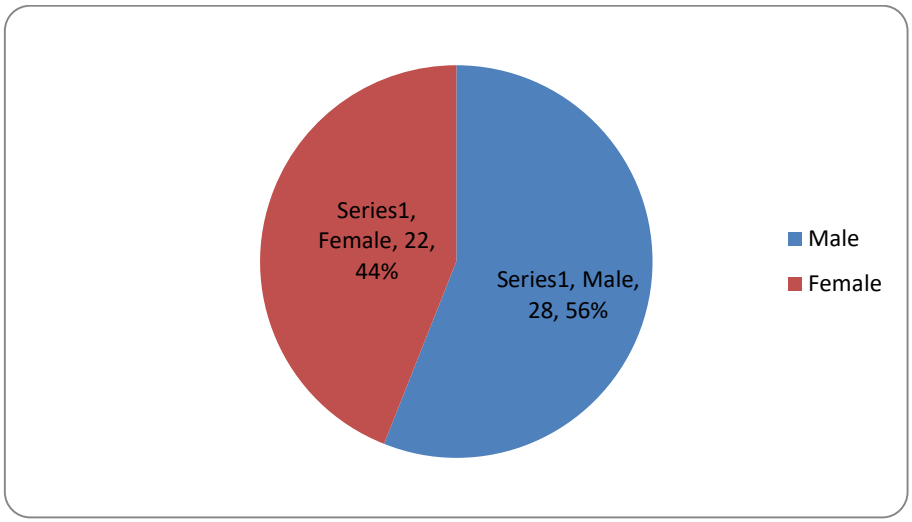

Fig-1: Gender wise distribution of the study participants.

The duration of symptoms were ranged between < 5 years to >10 years; the mean duration was 8.57 years (Table 2).

Table-2: Distribution of the participants according to the duration of symptoms; n (%).

Duration in years	Number
< 5	10 (20)
6 – 10	25 (50)
>10	15 (30)
Total	**50 (100)**

Combined low back and radiating pain was the commonest (70%) clinical symptom. Unilateral lower limb involvement was identified in 58% patients and bilateral involvement in the remaining (Table 3).

Table-3: Distribution of the participants based on the limbs involved; n (%).

Involvement	Participants
Unilateral	29 (58)
Bilateral	21 (42)
Total	50 (100)

Straight leg raising test (SLRT) was positive in 34% cases and limitation of extension was observed in 54% patients, 20% patients had limitation of all movements and the remaining were normal (Table 4).

Table-4: Straight leg test results among the participants; n (%).

Result	Participants
Positive	17 (34)
Negative	33 (66)
Total	**50 (100)**

After surgical management, 3(6%) patients reported poor pain relief, 5 (10%) patients had good pain relief, 12 (24%) patients reported very good and 30 (60%) patients had an excellent relief of pain. When post-operative walking distance was considered, 10% patients were able to walk < 50 feet, 56% walked 50 feet to 2 block and 34% could walk 2 blocks to 2 miles. Excellent SSSS end results was shoed by 78% participants, 16% reported good results, poor result by 16% and poor results in 8% cases.

Discussion

The natural history of stenosis remains challenging. The existence of tri articulate mobility as a functional unit and its close contact with neural structures, along with the existence of a main avascular structure (the intervertebral disc), are the factors responsible for this pathological condition [3]. Central stenosis results from a decrease in the canal diameter anteroposteriorly, transversally or a combination of these, secondarily to loss of disc height, annulus lesion and osteophyte formation, thus leading to instability that gives rise to hypertrophy of the facets and the yellow ligament [4].

Degeneration of the intervertebral discs causes decreased relative stability and for this reason, facet hypermobility occurs [5]. A study on cadavers suggested that pressure on the facets increases with decreasing disc height and with extension of the spine [6]. This would lead to hypertrophy of the facet joints, especially at the upper joint process. Because of this degeneration, calcification and hypertrophy of the yellow ligament occur.

The final result is reduction of the dimensions of the canal and compression of the neural elements. Fibrosis is the main cause of hypertrophy of the yellow ligament, and this is caused by the accumulated mechanical stress. The same process occurs with the lateral recess and the foraminal space. Foraminal stenosis frequently affects the root of L5, given that L5 S1 is the level with the lowest foramen/nerve root ratio [7, 8]. In relation to clinical characteristics, central stenosis causes neurogenic claudication. On the other hand, foraminal stenosis correlates with radiculopathy [4]. Ciric et al., observed that facet arthritis was the commonest cause of stenosis in this region, in conjunction with pathological conditions of the disc [9].

Considering the aetiopathogesis, in this study, wide laminectomy, discectomy, complete excision of ligamentum flavum and in cases of facetal hypertrophy we have treated with medial facetectomy. Amundsen et al., observed that the results from conservative treatment worsened over time, but if the surgical procedure performed within three years after initiation of treatment, results were not worse and there was no deterioration during the first six years of follow-up [10]. Atto Herno et al., reported 69.4% of good to excellent results in LSS, similar to the current report [11]. The outcome of decompressive laminectomy should not be overe-mphasized. Since the conclusion drawn to short and long term follow up was quite variable.

The same pathological process which was responsible for LSS preoperatively (Osteophytic enlargement of IAP), reactive thickening of lamina, Ligamentum hypertrophy will continue even after decompressive surgery causing postoperative stenosis. This would affect results in long term follow up.

Verbiest et al., reported one study with 27 years follow up of LSS; 43 of 147 patients relieved completely of their symptoms after decompression; sciatica with or without neurological deficits was the very commonly relieved symptom followed by intermittent claudication [12]. Similar to the current study, LBP was reported to be the most persisting symptom.

KWE Pain et al., reported 45% of patients having simultaneous backpain and leg pain in LSS [13]. P. N. Sanderson et al., reported all patients having radicular pain, 55% of patients had unilateral leg pain and 45% were having bilateral leg pain. All his patients had preceded back pain before leg pain [14].

Mervin Tile et al has observed 90% of patients had combined LBP and Leg pain [15]. In the present study 42% had bilateral leg pain and 58% had unilateral pain. 70% of our patients had combined LBP and radicular pain, only 30% had pure low backpain. Post operatively all the patients who were having back pain and radiating pains pre-operatively were relived from the pain; these findings are similar to Rajendranath et al. study [16].

Walking ability without the association of pain or discomfort is an important evaluation criterion for assessment after the treatment. Walking ability was classified as unlimited walking, > 2 blocks walking, < 2 blocks walking and house bound or bed bound walking.

Tom Amundsen et al., reported 30% patients showed improvement in walking in the first 4years, 20% patients in 4-10 years with surgical decompression [10].

Shabat S et al., reported that 9% (8) patients were unlimited walkers, 34% (30) patients were walking >2 blocks, 19% patients walked <2 blocks and 17% were house bound [17]. But Whitman et al., reported that 44% patients had poor walking distance in LSS [18].

In this study, we observed that, 17 (34%) patients had walking distance between 2 blocks to 2 miles, 28 (56%) patients had 50 to 2 blocks and 5 (10%) patients were able to walk <50 feet.

In one study reported that there were no unlimited walkers in prior to treatment, but after treatment 29% of patients having unlimited walking distance [19].

Limitation of the study: The sample size of the study was small.

Conclusion

Surgical decompression of laminectomy gives good outcome in degenerative lumbar spinal stenosis and there was excellent improvement of patients after surgery.

What the study adds to the existing knowledge?

Laminectomy gave good outcome in degenerative lumbar spinal stenosis with an excellent post-operative improvement.

Author's contribution

Dr. Kumar Yeswant K: Study design, data analysis and paper writing.

Dr. C Siva Rama Krishna: Study design and paper writing.

Dr. T Rajasekhar: Bench work, data analysis.

Dr. T Jaya Chandra: Data analysis, paper writing

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Ethical Approval: This study was approved by the Institutional Ethics Committee

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