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# Outcomes of surgical management of lumbar canal stenosis by laminectomy: A prospective study

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**Abstract**
LCS is a common disorder in elderly characterised by buttock and/or lower extremity pain, with or without back pain and is one of the most common reason for spine surgery after 65 years of age. LCS can be treated by conservative or surgical methods. The aim of our study was to analyse the outcomes of surgical management of LCS by laminectomy. Patients >50 years with clinically and radiologically proven LCS who failed conservative treatment and operated by open laminectomy were included in study. VAS for leg and back pain and ODI scores were calculated at presentation and each follow up. AP and lateral dynamic x-rays and MRI of LS spine was done in all patients. Final follow-up was done at 2 years. 102 patients (72 females and 30 males) with a mean age of 68 years were included in the study. VAS for back pain at presentation was 4 and of leg pain VAS 7 and ODI was 86. There were 7 cases of dural tear, one case of pseudomeningocele, 3 cases of superficial wound infection and one deep infection. VAS at final follow-up was 2 in leg and 3 for back pain and ODI was 24. Laminectomy is an effective treatment method for LCS not responding to conservative methods. Patients should be appropriately counselled preoperatively for persistent symptoms in the postoperative period.

**Keywords:** lumbar canal stenosis; surgery; laminectomy; outcomes

## Introduction
Lumbar canal stenosis (LCS) is a common disorder in elderly persons and the global incidence of LCS is on a rising trend [1]. Sumida *et al* in 1910 gave the first description of LCS due to foetal chondrodystrophy [2]. LCS is defined as a clinical syndrome of buttock and/or lower extremity pain, with or without back pain, associated with diminished space available for the neural and vascular elements [3]. It can be congenital or acquired or both [4, 5]. It is the most common reason for spine surgery after 65 years of age [6]. Intermittent neurogenic claudication is a characteristic feature of LCS and is thought to occur due to circulatory disturbance because of circumferential compression of nerve roots of cauda equine by the surrounding tissues [7]. Evans advocated exercise-induced ischemia as the cause of intermittent neurogenic claudication [8].

LCS can occur due to narrowing of central canal, lateral recesses or intervertebral foramen. The pathologic changes in spine responsible for LCS include facet hypertrophy, reduced disc height, disc bulge, osteophyte formation and flavum hypertrophy. The symptoms of LCS increase in standing, extension and walking and are relieved by rest in a flexed or seated position [5, 9].

The treatment of LCS varies from conservative treatment to surgical procedures like laminectomy, fusion, minimally invasive implants, spinal devices and prostheses [10, 11]. We performed this study to analyze the outcomes of surgical management of LCS by laminectomy at our institute.

## Materials and Methods
From January 2015 to December 2018, patients who were operated at our institute for LCS and satisfying the eligibility criteria were included in the study. The inclusion criteria were patients >50 years of age, any gender, and, clinically and radiologically proven LCS. The exclusion criteria were patients <50 years of age, revision surgery, tandem stenosis, no correlation between symptoms and the clinical presentation and follow-up duration <2 years. All of the patients were initially put on conservative trial in the form of medications, physical therapy, orthosis, activity modification, exercises and if needed epidural steroid injections, unless there were red flag signs. Patients not responding to conservative management were advised surgery. Written and informed consent was taken from all patients. Thorough history and detailed examination including neurological examination was done preoperatively and at each follow up. Visual analogue scale (VAS) scores for back and leg pain, and Oswestry disability index (ODI) scores were noted at presentation and at each follow up. Standing AP, lateral (Figure 1a and 1b) and flexion and extension x- rays were performed in all patients preoperatively to look for dynamic instability and MRI of lumbo-sacral spine (Figure 1c and 1d) was performed preoperatively to look for site and extent of pathology.

Patients were operated by standard open laminectomy via posterior midline approach under general anaesthesia in prone position. Posterior elements including spinous processes, laminae and flavum were removed to decompress the central canal.

Lateral recesses and foramina were decompressed whenever deemed necessary (Figure 1e). Wound was closed in a standard fashion over a suction drain. Post-operatively patients were encouraged to mobilize on the first post-operative day unless there was a dural tear in which case mobilisation was started after 3 days. Sutures were removed after 10-14 days.

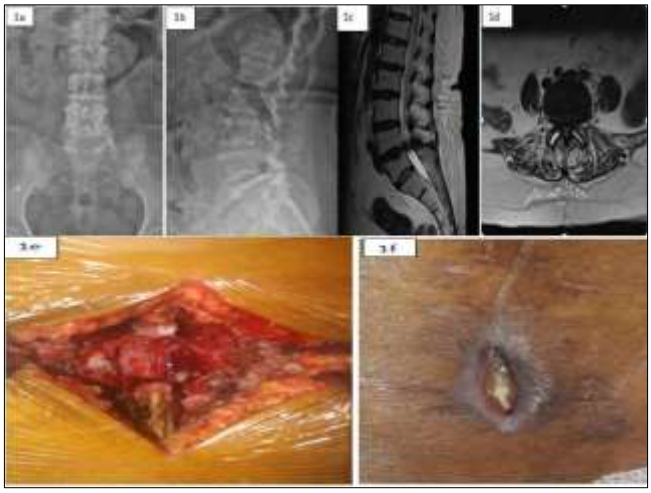

**Fig 1:** AP (1a) and lateral (1b) X-rays in standing position showing degenerative changes and decreased disc hieght at L4-5. T2 midsagital (1c) and T2 axial (1d) MRI picture showing severe canal compromise with ligamentum flavum hypertrophy. Intraoperative photograph after decompression (1e) and a case of deep wound infection after laminectomy for LCS (1f).

## Results

102 patients who satisfied the eligibility criteria were included in the study. There were 72 females and 30 males with a mean age of 68 years (range 55 to 85 years). The intensity of back pain was VAS 4 (range 3-7) and of leg pain VAS 7 (5-9) at presentation. Average ODI score at presentation was 86 (range 72-96). 12 patients had L3-L4 stenosis, 44 patients had L4-L5 stenosis, 23 patients had L5-S1 stenosis and 25 patients had stenosis at multiple levels.

The average duration of symptoms before surgery was 13 months (range of 3 to 24 months). Preoperative neurological examination revealed no case of cauda equina syndrome but 17 cases had partial weakness of foot dorsiflexors. The complications encountered in the study participants have been provided in Table 1.

**Table 1:** Complications encountered in the study participants

| S. NO | Complication | Number |
|---|---|---|
| 1. | Dural Tear | 7 |
| 2. | Late Onset Tear Withpseudomeningocele | 1 |
| 3. | Superficial Infection | 3 |
| 4. | Deep Infection | 1 |
| 5. | Leg Pain | 13 |
| 6. | Back Pain | 19 |

There were 7 cases of incidental dural tear during surgery which were manage by primary repair and augmented with muscle grafts. There was one case of late presenting dural tear presenting as pseudomeningocele 6 weeks after surgery which was managed conservatively. There were 3 cases of superficial wound infection managed with local wound care and one case of deep wound infection (Figure 1f) which was managed by wound debridement and secondary closure and further course insignificant. 13 out of 102 patients had persistent leg pain in the postoperative period and needed medications to control pain. 9 of these thirteen patients eventually improved at 6 months whereas 4 people had persistent symptoms, though with reduced severity. Persistent back pain in the long term follow up was seen in 19 patients which was however, not severe enough to limit activities of daily living. VAS leg at final follow up was 2 (range 0-6) and back pain was 3 (0-6). ODI score at final follow up was 24 (4-36). 3 patients were operated again for adjacent segment stenosis.

## Discussion

As per the North American Spine Society, up-to 50% of patients with mild to moderate LCS have favourable natural history and a rapid neurological deterioration Is rare in these cases. Kreiner *et al* in a 4-year study on patients with untreated LCS found that symptoms remained static in around 70%, improved in 15%, and worsened in 15% of cases. [12, 13]. Overall there is poor correlation between MRI picture and clinical symptoms hence the treatment should not be based on clinic-radiological correlation [14]. Most of the authors recommend an initial trial of conservative treatment especially in mild to moderate cases. Zweig *et al*. studied the effects of duration of conservative treatment on postoperative outcomes and concluded that conservative treatment duration was not associated with relief of leg pain postoperatively and surgical or general medical complication rates but surgical duration was longer with conservative treatment [15]. Zaina *et al*. in their study compared conservative treatment of LCS with surgery and found similar clinical results in both groups at 5 years with increased side effects (10% to 23%) in the surgery group [16]. The Spine Patient Outcomes Research Trial (SPORT) compared results of laminectomy with conservative treatment in LCS without listhesis. There was significant treatment effect in favour of surgery for pain reduction which was maintained at 2 and 4 years but the study had a high crossover rate [17]. Liu K *et al* in a systematic review concluded that epidural steroid injections provided minimal to no symptomatic relief or improvement in walking in LCS [18]. Surgical treatment by decompression is generally reserved for moderate to severe degree LCS patients who don't respond to conservative treatment [19]. First reports of surgical decompression of the nerve roots by removal of the posterior bony and ligamentous elements were made in 1977 [20]. Decompression alone is suggested for those patients whose predominant complaints are related to legs and are without instability [21]. Type of surgery to treat LCS varies from open laminectomy to minimally invasive procedures like laminoforaminotomy to endoscopic procedures. Presently there are no clear cut evidence-based guidelines regarding ideal treatment for a particular patient category. The best surgical option depends on location of pathology, the number of levels involved, and the presence of transitional anatomy or of instability or deformity. Whatever surgical modality is choosen, goal should be to properly decompress the compromised neural elements to provide symptomatic relief while preventing further degeneration in a way that does not destabilize the spine [19]. Need

for fusion in addition to decompression presently is controversial. The Swedish Spinal Stenosis Study, a large RCT compared decompression plus fusion with decompression alone. There was not any significant difference in clinical outcome or reoperation rates between the two groups at two and five years of follow-up regardless of the presence of degenerative spondylolisthesis [22].

## Conclusion

Decompressive laminectomy is an effective treatment method for lumbar canal stenosis which has not responded to conservative methods. Patients should be appropriately counselled preoperatively for persistent symptoms in the postoperative period.

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