

Case Series

Functional outcome of cauda equina syndrome treated by decompression and transforaminal lumbar interbody fusion in 11 cases: a case series

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Received: 27 November 2024

Revised: 28 January 2025

Accepted: 11 April 2025

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ABSTRACT

The unspecific description and definition of Cauda Equina syndrome (CES) in literature gives rise to a quantum of doubts regarding its decision making and management in clinical practice. Prospective analysis of 11 cases of CES, between Jan 2015 and Sep 2017, who had been treated with Decompression and Transforaminal Lumbar Interbody Fusion, was done. The varied presentations were studied and the following parameters were assessed in the evaluation of the functional outcome of each patient: Pain (assessed by the VAS-Visual Analogue Scale), Motor status (assessed by the MRC grading), Bladder recovery (graded as per Gleave and Macfarlane) and the Oswestry Disability Index. Our analysis of the results supported the following points: Increased duration of symptoms had a negative effect on the ODI at 3 months and 1 year, the denser the neurological deficit, the worse was the ODI score at 3 months and 1 year; age > 60 years had a negative effect on the ODI score at 3 months and 1 year, time to surgery since presentation had no significant effect on the overall functional outcome and ODI at 1 year, the mean VAS (Visual Analogue Scale) was drastically low at the end of 1 year with most of the patients almost free of back pain at the end of 1 year, bladder recovery was also related to the duration of symptoms and the age of the patient, as increasing age and longer duration of the deficits had a negative impact on the bladder recovery ultimately.

Keywords: Cauda equina syndrome, Oswestry disability index, Transforaminal lumbar interbody fusion

INTRODUCTION

Cauda Equina syndrome (CES) is a syndrome. Unfortunately, there is no universally agreed definition of CES. The literature includes symptoms and/or signs from modest cauda equina irritation to catastrophic neurological injury.¹ Symptoms and/or signs can include impairment of bladder, bowel, urethral or perineal sensation, problems in micturition, incontinence of urine or faeces, a palpable bladder and/or impairment of anal sphincter tone. Before CES, there may be bilateral radicular pain and/or dermatomal sensory loss and/or motor weakness. A previous literature review noted a lack of commonality of symptoms and/or signs in 25% of the papers examined, causing diagnostic uncertainty.² CES can be subdivided

into three categories.³ Firstly, CES suspected or suspicious (CESS) is the patient with a bilateral radiculopathy, who does not have CES but if the bilateral radiculopathies are caused by a large central prolapsed disc, then the patient is at risk of developing CES.

Secondly, incomplete CES (CESI) is the patient who has objective evidence of CES, typically impaired perineal sensation and some sphincter problems but retains voluntary control of initiating and stopping micturition. Thirdly, CES retention (CESR), describes the patient with a paralysed, insensate bladder; the bladder retains urine, which is painless and subsequently there is incontinence of urine. CESR does not imply complete loss of cauda equina (CE) function. No symptom or combination of symptoms/signs reliably excludes or confirms CES.^{4,5}

CASE SERIES

We had prospectively analysed 11 cases of CES between March 2015 and Dec 2016 who had been treated with Decompression and Transforaminal Lumbar Interbody Fusion. Our inclusion criteria were as follows, all cases of back pain with weakness of the lower limbs and/or bowel bladder involvement fitting into the spectrum of Cauda equine syndrome caused by intervertebral disc prolapse.

The exclusion criteria were previous spinal surgery, coexistent cervical/ thoracic myelopathy, inability to respond to questionnaires or to perform activities of daily living due to comorbidity (examples: Cerebrovascular accident, Parkinsonism, Psychotic illness).

Few patients had other combined pathologies of the spine such as spinal stenosis, spondylolisthesis and multi-level disc degeneration. All of the patients, after thorough clinical examination, underwent an MRI of the lumbar spine prior to the surgical procedure for planning of the decompression and assessment of the cauda equina roots.

All the patients underwent decompression at the involved intervertebral level followed by transforaminal lumbar interbody fusion with a titanium cage and posterior instrumentation.

Autologous bone graft for fusion was obtained by nibbling the inferior articular process of the vertebra above and partly from the superior articular process of the vertebra below the intervertebral disc (i.e., if the L4-L5 space was involved, autograft was obtained from the L4 inferior articular processes and the L5 superior articulating processes). No Bone Morphogenic protein, Demineralized Bone Matrix, allograft or bone substitutes were used.

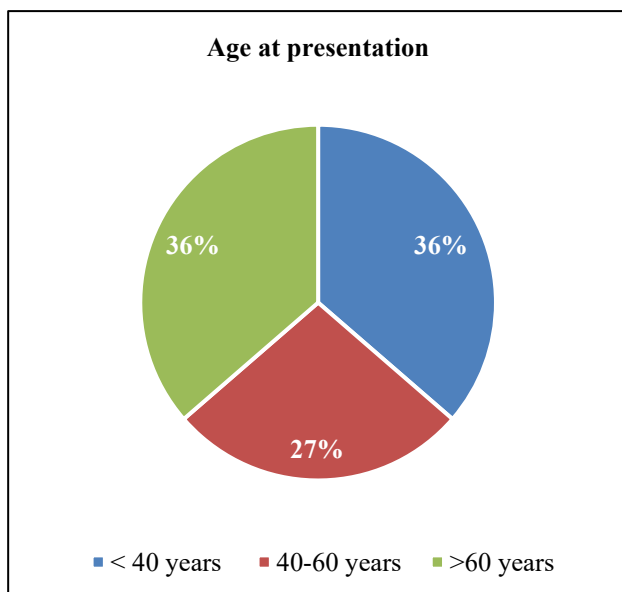


Figure 1: Age distribution—no specific age predilection.

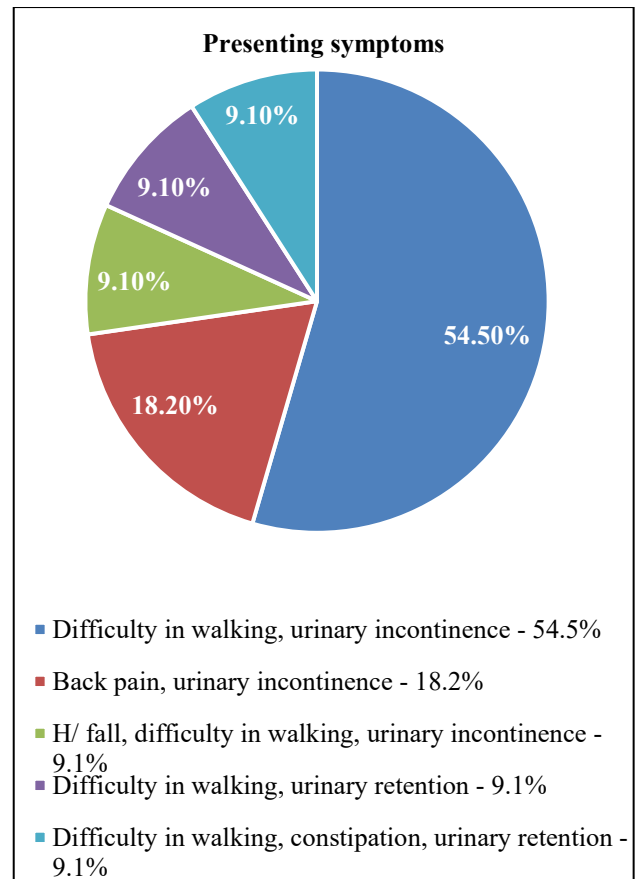


Figure 2: Distribution of the various presenting symptoms—54.5% patients presented with difficulty in walking and urinary incontinence.

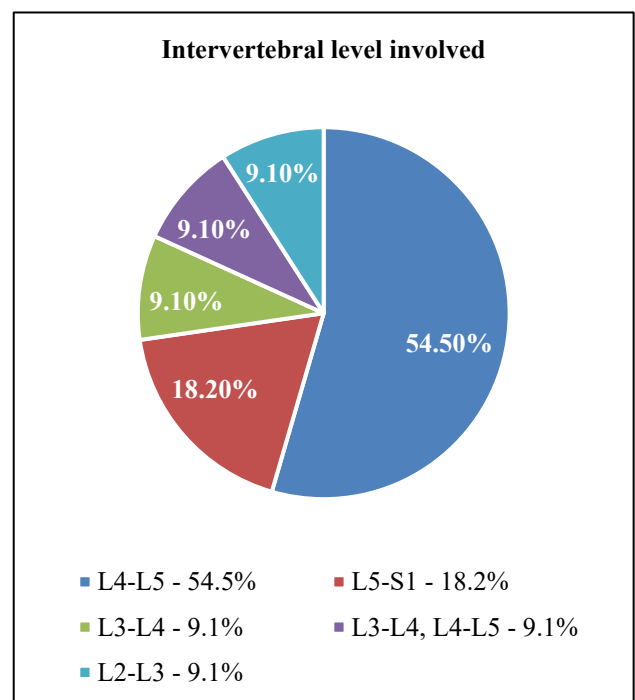


Figure 3: Distribution of the intervertebral level involved in various cases—L4-L5 was the most common level involved (54.5%).

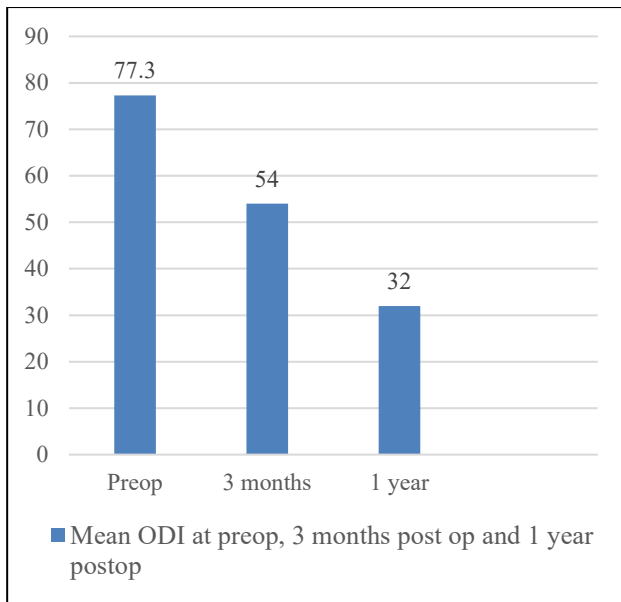


Figure 4: Mean ODI (Oswestry Disability Index) at pre op, 3 months and 1 year—80% of patients were crippled at preop evaluation. The ODI gradually decreased postoperatively over the course of 1 year.

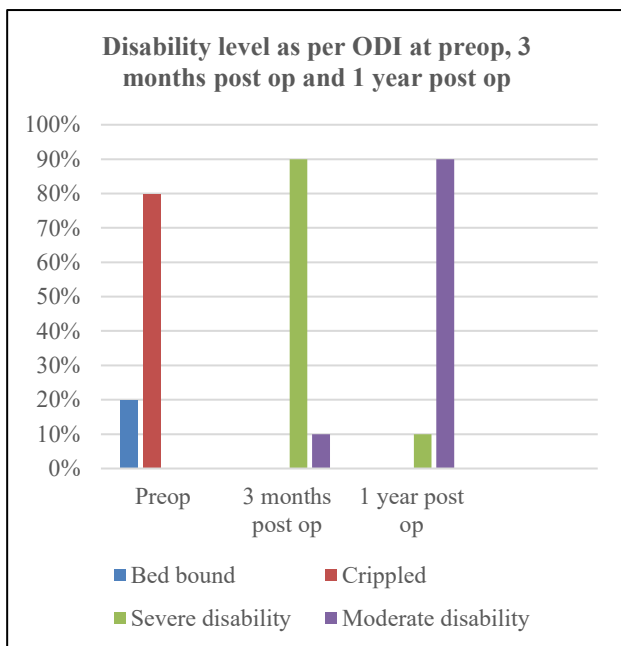


Figure 5: Disability level as classified based on the Oswestry disability index—preoperatively, 80% were classified crippled, at 3 months post op, 90% had severe disability and at 1 year, 90% had moderate disability.

The following parameters were assessed in the evaluation of the functional outcome of each patient: Pain (assessed by the VAS-visual analogue scale), Motor status (assessed by the MRC grading), bladder recovery (graded as per Gleave and Macfarlane), Oswestry Disability Index.^{6,7} The Oswestry disability index ranged from 0 to 100 and the visual analogue scale ranged from 0 to 10. Oswestry

Disability Index, MRC grading of motor status and VAS scores were calculated during the preoperative period and at intervals of 3 months and 1 year following surgery. The bladder recovery was graded as per the study by Gleave and Macfarlane.⁶ The critical factors such as duration of symptoms, preoperative neurological status, time to surgery after diagnosis, intra/postoperative complications were given significance.

All the data was entered into MS Excel and analysed using the statistical software SPSS version 22.0. All categorical variables were expressed as in percentages (%) and continuous variables in mean and standard deviation (S.D) or median with interquartile range. A Chi-Square test was used for comparison of categorical variables. Paired comparisons of quantitative variables were analysed by Wilcoxon Signed Rank Test.

The age of the patients ranged from 24 to 77 years with most of the cases falling in the 30-40 years and above 60 years age groups. Males formed the majority constituting 63.6%. 54.5% of the cases presented with symptoms of difficulty in walking and urinary incontinence making it the most common presenting symptom in this series.

The L4-L5 intervertebral disc was most commonly involved constituting 54.5% of the total cases studied. The duration of symptoms was more than 3 days in 63.6% of the cases. 45.5 % of the patients were operated within 12 hours of presentation. Recovery of the bladder status at the end of 1 year was good in 63.6% of the cases studied as per the Gleave and Macfarlane grading.⁶ The mean VAS score at pre op was 6.9, at 3 months was 3.3 and at 1 year was 1.

Grading of the motor power was done as per MRC grading at pre op, 3 months and 1 year. The motor recovery was inversely proportional to the duration of symptoms and the density of neurological deficit. As per the Oswestry Disability Index, 80% of the patients were classified crippled at the preoperative evaluation. At 3 months, about 90% had severe disability and at 1 year about 90% had moderate disability. Gradual recovery of overall function was noted.

DISCUSSION

Statistical analysis was done and attempts to derive relationships between the ODI score and the duration of symptoms, time to surgery and age of the patient were made. Analysis supported the following points.

Increased duration of symptoms had a negative effect on the ODI at 3 months and 1 year. The denser the neurological deficit, the worse was the ODI score at 3 months and 1 year. Age more than 60 years had a negative effect on the ODI score at 3 months and 1 year. Time to surgery since presentation had no significant effect on the overall functional outcome and ODI at 1 year. The ODI scores were comparable to other similar studies in which

decompression alone was the surgical management.^{8,9} Whereas, the VAS scores were drastically low at the end of 1 year with most of the patients almost free of back pain at the end of 1 year.

Bladder recovery was also related to the duration of symptoms and the age of the patient as increasing age and longer duration of the deficits had a negative impact on the bladder recovery ultimately.

There is no combination of clinical symptoms and/or signs that reliably predict CE compression. If CES is suspected (CESS, CESI or CESR) a detailed history and clinical examination (including DRE) and MRI should be performed. Several studies that have attempted to compare data from the different papers suffer from the problem that the populations are heterogeneous with uncorrected variables, different definitions of CES, failures to set out the nature and timing of surgery or the experience of the surgeon, along with variable reporting of outcomes and losses to follow up.¹⁰⁻¹⁴

Ahn et al, stated that the CES patient could be treated at any time up to 48 hours after the onset of CES, implying that there is a safe time window of 48 hours for treatment.¹² This study has been criticized on the basis of methodology and misinterpretation of the data.¹³ A recent study repeated Ahn et al, work and could find no difference between those treated <48 hours or >48 hours.^{11,12} In that paper, the CES patients were divided by the degree of neurological deficit, whether CESS, CESI or CESR, yet these are not homogenous groups and patients were found to develop more severe deficits within a group, such as progressive motor weakness or more severe sphincter dysfunction.

There is increasing recognition that deterioration in function in the CES patient is continuous and progressive.^{11,15,16} In a series of 139 patients with CESI, it was found that bladder outcomes were dependent on time. Normal bladder function was found in 88.9% of patients treated within 24 hours, 79% of cases treated within 24 to 48 hours and only 44% of those treated more than 48 hours after CESI.¹⁷

In a small series of medicolegal patients, the probability of the patient having more severe losses of perineal sensation and/or anal tone increases from CESI to CESR and with more prolonged CESR.¹⁷ Therefore, there is evidence that the duration of CE compression is a determinant of outcome, with progression of neurological deficits and worse outcomes where there is more prolonged compression in CESI patients.

Patients with bilateral radiculopathy (CESS) do not have CES, however, they are at risk of CES if they have a large central prolapsed intervertebral disc. If the MRI showed a large central prolapsed intervertebral disc compressing the CE roots, the patient is opted for surgery preferably within the next 24 hours. The CESI patient should be operated upon as an emergency as deterioration to CESR can occur

rapidly. As per Todd in his study, the best outcomes will be achieved where patients are operated upon with the least neurological deficits and the shortest duration of CE compression.^{17,18} Qureshi et al and Sell et al in their study on functional outcome post decompression alone in 33 CES patients demonstrated a median VAS of 4 and Median ODI score of 27 at the end of their 1 year follow up.¹⁹

Upon analysis of other similar studies which have used decompression alone as the primary surgical management, the ODI scores are comparable to our study and there is a significant decrease in the VAS scores at the end of 1 year in our study.^{8,9,19,20}

CONCLUSION

All the statistical findings were supporting our rationale of opting Transforaminal lumbar interbody fusion (TLIF) for primary surgical management of CES. Our rationale of opting TLIF was as follows: The Cauda equina roots are already compressed and damaged due to a large posterior central disc, therefore, if laminectomy/ discectomy or both is done, it results in further root manipulation and damage due to root retraction. During TLIF, minimal retraction of the injured nerve roots is needed.

The decompression is wholesome and better involving the central canal and both neural foramina. The neural foramen on the other side is decompressed by using the "Over the Top" technique. Fusion at the involved level with TLIF provides a stable milieu for the nerve roots to recover by providing adequate stability. Further studies comparing the functional results of decompression alone versus decompression and TLIF for Cauda equine syndrome for better understanding of the pros and cons of both procedures are needed.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Thuppale VE, Unnikrishnan R. Functional outcome of cauda equina syndrome treated by decompression and transforaminal lumbar interbody fusion in 11 cases: a case series. *Int J Res Orthop* 2025;11:869-73.