Vol-7, Issue-1 PP. 5-12 ISSN: 2394-5788

GLOBAL JOURNAL OF ADVANCED RESEARCH
(Scholarly Peer Review Publishing System)

CLINICAL AND NEUROLOGICAL OUTCOMES IN PATIENTS WITH CAUDA EQUINA SYNDROME: A PROSPECTIVE STUDY DONE IN TERTIARY CARE NEUROSURGERY FACILITY OF EASTERN INDIA.

Dr. Srikrishna Majhi
MBBS, MCh, Assitant Professor,
Department of Neurosurgery,
Bangur Institute of Neuroscience,
IPGMER, Kolkata,
India

Dr. Sabyasachi Saha
MBBS, MS, Post Doctoral Trainee (MCh),
Department of Neurosurgery,
Bangur Institute of Neuroscience,
IPGMER, Kolkata,
India.
sabya.nrs2006@gmail.com

Dr Anup Kumar Chaudhuri
MBBS, MS, MCh, Professor, Department of Neurosurgery,
Bangur Institute of Neuroscience, IPGMER, Kolkata,
India

ABSTRACT

Objective: The primary objective of this study was to analyze the clinical and neurological outcomes in patients admitted with cauda equina syndrome (CES) at the Bangur Institute of Neuroscience, Kolkata, India from May 2018 to Oct 2019.

Methods: This was a single center prospective study done at Bangur Institute of Neuroscience, Kolkata, India from May 2018 to Oct 2019. Patients admitted with diagnosis of cauda equina syndrome were included in the study. The following variables were analyzed: gender, age, etiology of the disease, level of the injury, time interval between onset of symptoms and surgery, pre operative and post operative JOA (Japanese Orthopedic Association) score, Recovery Rate (RR) from JOA score.

Results: Overall, 32 patients were included in the study. Most of them were males (78 %) with an average age of 38.1 years. Most common cause of CES in our study was lumbar disc herniation and L4L5 level was most commonly involved. Only 6 patients (18%) presented before 48 hrs. When Recovery Rate (RR) was calculated it was found that only 12 patients (37.5%) had good recovery (RR 51-75%). When we calculated the association of different variables with recovery rate it was found that patients undergoing surgery in less than 48 hrs of symptom onset had good recovery rate (RR>50%) and the result is statistically significant (p value 0.018).

Conclusion: So the prospective observational study showed that Cauda equina syndrome is most commonly caused by lumbar prolapsed disc disease. There is significant delay in presentation which is caused by delay in diagnosis and referral. Better outcome in recovery rate was found in patients who presented to the health facility within 48 hrs and underwent surgery within 48 hrs.

Keywords: Cauda equina syndrome (CES), lumbar disc herniation, JOA recovery rate

1. INTRODUCTION

Cauda equina syndrome (CES) is a neuropathy of two or more nerve roots in the spinal canal below the level of conus medullaris and usually presents with the following typical signs and symptoms: unilateral/bilateral pain radiculopathy, saddle anesthesia or genital sensory disturbance; bladder or bowel incontinence, and lower extremity weakness (1-3)). However, CES is often challenging to diagnose.
CES is rare: incidence rates ranging from 1 in 33,000 to 1 in 100,000 (1) have been reported. In a retrospective study that involved one of the largest cohorts of patients studied to date, it was concluded that the overall incidence of CES was 7 per 100,000 individuals (4). However, the actual occurrence of CES is difficult to estimate partly due to the fact that there is not a single universally accepted clinical definition. The pathogenesis of CES is thought to be mechanical or ischemic compromise of the spinal nerve roots. Spinal nerve root compression commonly occurs in conditions such as acute herniated disc, spinal stenosis, trauma (e.g., burst fractures), metastatic or primary tumors of the spine, or spinal infections (e.g., epidural abscess). CES secondary to lumbosacral intervertebral disc prolapsed often presents acutely.

The detailed history and the neurological examination is preliminary which is confirmed with imaging studies such as computed tomography (CT) and the gold standard, magnetic resonance imaging (MRI). MRI is solely required for determining the etiology and nature of compression.

CES is a neurosurgical emergency and treatment of which is surgical decompression, which, if performed urgently, reduces neurological damage and improves the outcome.

The primary objective of this study was to investigate the epidemiology of cauda equina syndrome in a tertiary care neurosurgery facility of eastern India and to assess clinical and neurological outcome of patients with cauda equina syndrome.

2. MATERIALS AND METHODS

At first ethical committee clearance was taken from institutional ethical committee. Then this non randomized prospective study was done at the Department of Neurosurgery, Bangur Institute of Neuroscience & SSKM Hospital, Kolkata, India between May 2018 to October 2019. Patients who are fulfilling the criteria of cauda equina syndrome were included in this study. Patients who had one or more of the following findings (a) bladder or bowel dysfunction, (b) reduced sensation in the saddle area, or (c) sexual dysfunction, with possible neurologic deficit in the lower limb (motor/ sensory loss, reflex change) were diagnosed as having cauda equina syndrome and thus included in the study. Those patients who were not willing to participate in this study were excluded.

After written informed consent the following variables were recorded in all patients: age, gender, mode of presentation, clinical symptomatology, clinical findings, disease etiology, topographic level of lesion, time delay from onset to surgery, level of neurological deficit, presence of neurogenic bladder, clinical and radiological investigations, type of surgical procedure, post operative evolution and outcome. Clinical effectiveness was evaluated Japanese Orthopaedic Association (JOA) score (29 points). The recovery rate (RR) of JOA score was calculated according to the following formula: RR = (postoperative scores – preoperative scores)/(29 - preoperative scores) X 100%. Based on the preoperative, postoperative and last follow-up scores, the RR was calculated. According to RR, clinical effect was divided into five grades. RR >75%, excellent; RR > 50%-75%, good; 10% ≤ RR <50%, moderate; 0 % ≤ RR <10%, poor; RR <0%, deteriorated. As, we have just 32 patients included in the study and CES is a rare disease, this small sample size may limit the detailed comparisons. Thus, we only performed comparisons regarding RR ≥ 50% and RR<50%. Clinical follow-up observations were carried out by outpatient basis at 3 and 6 months after operation.

The data thus generated analyzed statistically using SPSS software, version 26.

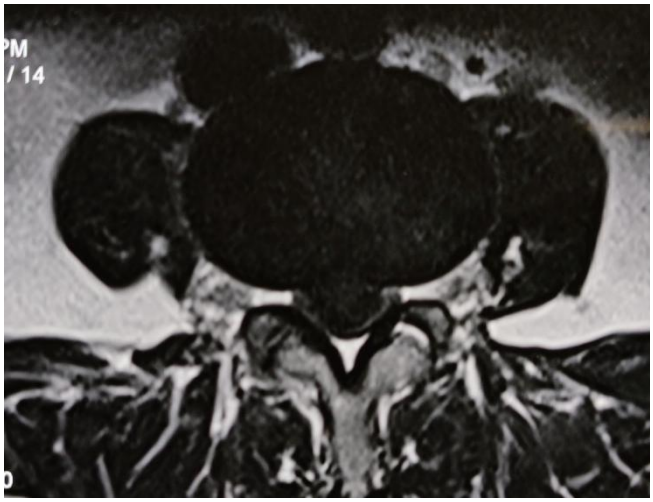

Figure 1 MRI Lumbo sacral spine (T2) Axial section showing prolapsed L3L4 di

Figure 2 MRI Lumbo Sacral spine Sagittal section showing L3L4 Prolapsed intervertebral disc

Figure 3 Showing excised disc material

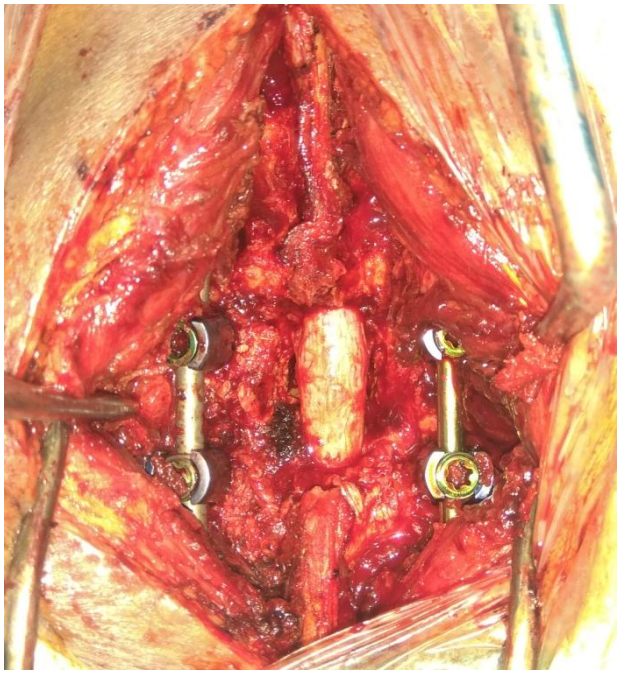

Figure 4 Showing intra operative of decompressed thecal sac and transpedicular screws and rods in place

3. RESULTS:

36 patients were included initially but 4 patients lost to follow up subsequently, thus a total of 32 patients fulfilled the inclusion criteria and thus included in this study. Among them 25 patients (78.12%) were male and the rest (7 patients) were female (21.88%). The patients had a mean age of 38.84 ± 11 years, ranging from 20 to 65 years. Most of the patients reported to this institution more than 48 h of symptom onset **(Table1).** The most prevalent etiologies, in their descending order are shown in **Table 2**. The most commonly affected topographic levels are L4-5 and L5-S1 **(Table 3).** The clinical follow-up observation was carried out by outpatient review. The patients were regularly followed up rigorously by independent evaluators at 3, 6 months after operation. Japanese Orthopaedic Association (JOA) score (29 points) was assessed pre-operatively and at follow up evaluations at 3 month and 6month after surgery. On calculation of Recovery Rate from pr operative and post operative JOA scores it was found that only 12 patients had good recovery, 19 patients had fair recovery and one patient remained unchanged. No patient had excellent or worsened Recovery Rate **(Table 4).** All patients underwent decompression of the thecal sac. 25 patients were diagnosed to have lumbar prolapsed intervertebral disc. Among them, 14 patients (43%) underwent laminectomy and discectomy and the rest 11 patients underwent fixation along with discectomy. TLIF cage fusion was done in 3 patients. Patients diagnosed to have spinal tumor underwent laminectomy and excision of the tumor. And patients who had CES due to trauma and infection underwent laminectomy with fixation only. Among the total 32 operations we faced complications in 4 patients. Wound infection occurred in 1 patient. Intraoperative dural tear occurred in 2 patients particularly during the dissection of thecal sac off the herniated disc. In both occasions the tear was lateral thus could not be repaired and was managed with muscle patch and fibrin glue. Both the patients didn't develop any post operative CSF leak. One patient developed CSF leak post operatively which was also managed conservatively.

Table 1 Distribution of cases based on time duration between symptom onset and surgery

Time duration between symptom onset and surgery	Patients (n=32)	Percentage (%)
<48 hrs	6	18.7%
>48 hrs	26	81.3%

Table 2 Distribution of cases based on etiology of CES

Etiology	Patients (n=32)	Percentage (%)
Disc herniation	25	78%
Tumor	3	9.4%
Trauma	2	6.3%
Infection	2	6.3%

Table 3 Distribution of cases based on level of lesion

Level of lesion	Patients (n=32)	%
T12	1	3.1%
L1	2	6.2%
L2-3	1	3.1%
L3-4	3	9.4%
L4-5	14	43.8%
L5-S1	11	34.4%

Table 4 Distribution of cases based on Recovery Rate (RR)

Recovery rate	Number of patients (n=32)	Percentage (%)
Excellent (76-100%)	0	0%
Good (51-75%)	12	37.5%
Fair (26-50%)	19	59.4%
Unchanged (0-25%)	1	3.1%
Worsened (<0%)	0	0%

Table 5 Association of various factors with Recovery Rate

Variable	RR ≥ 50%	RR <50%	Total	p-value
Age group (yr)				0.076
20-40	9	7	16	
41-60	3	11	14	
>61	0	2	2	
Sex				0.683
Male	10	15	25	
Female	2	5	7	
Etiology				0.485

Lumbar disc herniation	9	16	25	
Tumour	2	1	3	
Trauma	0	2	2	
Infection	1	1	2	
Time between onset and surgery				**0.018**
<48 hrs	5	1	6	
>48 hrs	7	19	26	
Level of disease				**0.924**
D12-L1	1	1	2	
L2-L3	0	1	1	
L3-L4	1	2	3	
L4-L5	6	8	14	
L5-S1	4	7	11	
Total outcome	12	20	32	

When we calculated the association of different factors (as depicted in the above table) with recovery rate (calculated from pre operative and post operative JOA score) it was found that patients undergoing surgery in less than 48 hrs of symptom onset had good recovery rate (RR>50%) and the result is statistically significant (p value 0.018). whereas other variables (age, sex, etiology, level of disease) did not affect the recovery rate (p values 0.076, 0.683, 0.485 and 0.924 respectively).

Table 6 Comparison of RR regarding duration before surgery

Group	>48 hr	<48 hr
RR >=50%	7	5
RR< 50%	19	1
P=0.0185		

On calculation of Recovery Rate from pre operative and post operative JOA scores it was found that only 12 patients had good recovery, 19 patients had fair recovery and one patient remained unchanged. When this result was compared with patient groups divided based on duration of symptoms before surgery it was noted that those patients who presented before 48 hrs had good recovery and the result is of statistical significance (p value 0.0185)

Table 7 Comparison of pre operative and post operative JOA scores

Groups	Pre operative	Post operative at 3 months	Post operative at 6 months
Mean JOA score	5.06	12.93	16.03
Standard deviation	1.18	2.51	2.55

Mean JOA score is 5.06 preoperatively, while it is 12.93 and 16.03 postoperatively at 3 months and 6 months follow up with statistical difference (P<0.00001).

4. DISCUSSION

In our study time of 1 year and 6 months we could enlist only 32 cases of CES. CES is often a neglected disease in developing countries. CES cause significant social and financial costs and is still an often-underestimated disease in emergency services. In our present study, more than 81% of the patients (n = 26) sought or were referred to our hospital much later than the recommended 48 h. This delay in presentation or referral could be conferred to the overall lack of awareness among the general population as well as physicians of the referring hospitals about the nature of the disease and the role of emergency decompression. In our study we have found that main etiology for CES was lumbar disc herniation (78%), followed by tumor (9.3%) (5, 6) trauma (6%) (7) and infection (6%) (8). **Andre Luiz et al** in their study of epidemiology of CES found similar results (9).

Ahn et al in their study concluded that CES can have diverse phenotypes; the most common symptom being difficulty in urination (bladder symptoms), followed by bowel incontinence, constipation, and sexual dysfunction (10). Bladder symptoms can either be complete (CES-R) or incomplete (CES-I) (11). CES-R are those patients who have complete loss of voluntary bladder control along with either acute retention or overflow incontinence. CES-I patients present with vague symptoms such as sensation of incomplete voiding, urgency, poor urinary stream, and urinary straining (11). In their study, **Gardner et al.** (11) noted that 50%–70% of patients had CES-R with poor prognosis, whereas CES-I patients accounted for 30%–40% of the cases and had a good prognosis (11). In our present study we had both types of patients, but we did not assess the completeness of CES.
Beculic et al. (12) reported L4–L5 as the most commonly involved level in LDH, similar to our finding.
There is extensive research by several authors to know the association between the surgery duration in CES from the time of symptom onset and outcome, and early surgery is recommended, when feasible (10, 12). Most patients (81%) in our study presented after 48 hours of symptom onset; however rest of the patients who presented and operated within 48 hours had better outcome both in JOA recovery rate as well as bladder recovery. Our findings were similar to those reported by **Beculic et al** (12).
All the patients in our study underwent decompression with or without fusion and tumor excision (in cases of CES caused by tumor). The correlation between bladder recovery and surgery type was not performed because we believe that the primary objective of surgery in CES was adequate decompression, and fusion, based on any obvious or impending instability.

5. LIMITATION

There were few limitations in our study. One important limitation was that we did not assess the CES type in terms of whether it was complete or incomplete. As well as bladder recovery was also not assessed. This study was performed within a time frame of 1 year and 6 months which is a short period for complete assessment of the rare disease like CES.

6. CONCLUSION

So the prospective observational study showed that Cauda equina syndrome is most commonly caused by lumbar prolapsed disc disease. There is significant delay in presentation which is caused by delay in diagnosis and referral. Better outcome in recovery rate was found in patients who presented to the health facility within 48 hrs and underwent surgery within 48 hrs.

Conflict of interest

There is no potential conflict of interest in this study.

References

[1] Gardner A, Gardner E, Morley T. Cauda equina syndrome: a review of the current clinical and medico-legal position. *Eur Spine J*. 2011;20:690-697.
[2] Shi J, Jia L, Yuan W, et al. Clinical classification of cauda equina syndrome for proper treatment. *Acta Orthop*. 2010;81:391-395.
[3] Spector LR, Madigan L, Rhyne A, et al. Cauda equina syndrome. *J Am Acad Orthop Surg*. 2008;16:471-479.
[4] Schoenfeld AJ, Bader JO. Cauda equina syndrome: an analysis of incidence rates and risk factors among a closed North American military population. *Clin Neurol Neurosurg*. 2012;114: 947-950.
[5] Kostuik JP, Harrington I, Alexander D, Rand W, Evans D. Cauda equina syndrome and lumbar disc herniation. J Bone Joint Surg Am. 1986;68(3):386–91.
[6] Kebaish KM, Awad JN. Spinal epidural hematoma causing acute cauda equine syndrome. Neurosurg Focus. 2004;16(6):e1.
[7] Anthony S. Cauda equina syndrome. Med Protect Soc Casebook. 2000;20:9–13.

[8] Curtin P, Sankar R, Fogarty EE. It's never too late: cauda equine syndrome in an octogenarian. Injury Extra. 2005;36:242–4.
[9] Kelly CE. Evaluation of voiding dysfunction and measurement of bladder volume. Rev Urol 2004;6 Suppl 1:S32-7.
[10] Ahn UM, Ahn NU, Buchowski JM, Garrett ES, Sieber AN, Kostuik JP. Cauda equina syndrome secondary to lumbar disc herniation: a meta-analysis of surgical outcomes. Spine (Phila Pa 1976) 2000;25:1515-22.
[11] Gardner A, Gardner E, Morley T. Cauda equina syndrome: a review of the current clinical and medico-legal position. Eur Spine J 2011;20:690-7.
[12] Beculic H, Skomorac R, Jusic A, et al. Impact of timing on surgical outcome in patients with cauda equina syndrome caused by lumbar disc herniation. Med Glas (Zenica) 2016;13:136-41.