

## Review Article

# Postoperative Cauda Equina Syndrome: A Report On 10 Patients with Literature Review

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## Abstract:

**Background:** Cauda equina syndrome (CES) is a serious condition used to describe the signs and symptoms of patients with compressive neuropathy of multiple lumbar and sacral roots, though in rare cases no compression was discovered, and probably the pathology is related to ischemic changes, this syndrome is well known as an indication for urgent lumbar surgery. It is very rarely seen after surgery, in this study the authors described 10 cases of CES that occurred following uneventful lumbar spine procedures, all had open lumbar decompression.

**Patients and methods:** Preoperative, operative and post-operative management will be discussed. Special emphasis on the high index of suspicion and the value of MRI as a diagnostic procedure. The age range between 35 to 70 years, six were female and four were males, six had decompression for lumbar canal stenosis, four had CES following lumbar discectomy.

Eight had urgent decompression after CES while two were treated conservatively. All presented with cardinal clinical features of CES, in seven patients it was complete while in three patients it was incomplete. The relevant literatures were reviewed.

**Conclusion:** High index of suspicion is required for early detection of postoperative CES Special surgical technique may reduce the incidence of this syndrome. Wide lumbar decompression or other procedures is urgently required when there is positive MRI findings of compression. Full recovery is not always possible.

## Introduction:

Cauda equina syndrome (CES) refers to signs and symptom of multiple lumbar and sacral roots compression or ischemia, the syndrome is characterized by unilateral or bilateral sciatica, lower limb weakness, or even paralysis, saddle type of hyperesthesia, bowel and bladder dysfunction (McLaren AC, Bailey). (1) It is usually caused by extradural compression probably the commonest is central disc prolapse at L4-L5 and L5-S1, trauma, tumor, infection, and spinal stenosis (Allen Gardner). (2) A wide range of iatrogenic causes were reported, including manipulation, spinal anesthesia and other causes.

This syndrome is rare in the postoperative period and related to so many causes like: Neuro ischemic changes. (Mantu). (4) Post discectomy (McLaren). (1) Migration of a free fat graft (D deburge). (5)

Root and dural injury (Ne Epstein). (6) Dural shift with

engorgement of epidural venus plexus (Maki). (7) Spinal epidural hematoma (kebaish). (8) Engorgement of ventral epidural venus plexus (Motohiro takayama). (9) Posterior migration of lumbar disc prosthesis (ol cay esser). (10) Excessive traction on the root and dura (Tianyang yuan). (11) Trans dural cauda equina herniation after uneventful lumbar surgery. (Yohei kakuta). (12) After disc prolapse (Mohammedi Badra). (13) Following decompression of spinal stenosis (Jan Williams). (14) On very rare occasion cauda equina follows lumbar surgery, but it is not always related to surgery like in Elsberg syndrome which is an acute or subacute radiculitis and myelitis confined to lower spinal cord, following an acute or reactivation of viral infection (Hussein) (15) reported one case of Elsberg syndrome after spinal fusion surgery, it was due to herpes Simplex virus leading to menegioradiculitis. The literature sites for incidence of postoperative CES was between 0.08% and 0.2% (Jensen R.L.) (16)

This complication appears to occur more commonly than the literature suggests. So, every practicing spine surgeon should be fully aware of this complication and to guard against its occurrence at the time of surgery. Some cases need urgent decompression because the outcome is much better with early interference.

CES is either complete with urinary retention or incomplete when some of the sign and symptoms are not apparent. The aim of our study is to present our local experience with 10 cases of post-operative CES with the relevant literature review, hoping to make the spine surgeons fully aware of this real emergency situation.

**Patients and method:**

This is a prospective study of 10 consecutive patients ended up with cauda equina syndrome after lumbar laminectomy. Seven patients had complete CES with urinary retention while three had partial CES. Six had decompression because of severe lumbar stenosis and four patients had disc prolapse. Only one patient had fixation, we started in November 2018 and end up in January 2024. These 10 patients are out of 1103 lumber laminectomies performed throughout the period of the study. This review involves the details of the preoperative, operative and postoperative period. The diagnosis was made when the following were present: saddle numbness, loss of anal sphincter tone, urinary retention in cases with complete cauda equina syndrome, unilateral radicular pain and sexual function alternation. From each patient record the following data were

obtained: age, gender, date of birth, preoperative diagnosis, operative findings, surgical procedure, level of decompression with or without discectomy, postoperative clinical features of cauda equina with a special emphasis on urination, progress of the condition was confirmed. All patients have preoperative and postoperative magnetic resonance imaging study and/or computer tomography which confirmed the compression. all had the surgery in one center and by one surgeon. The exact definition of the operative technique was sought from the surgical report, in addition the history of preoperative operative and postoperative symptoms and signs was obtained in all these patients.

Patients were divided into complete and incomplete CES depending on the severity of the condition and the urinary involvement.

**Results:**

Out of 1103 lumber laminectomy in the orthopedic department of Basrah University Teaching Hospital, 10 patients developed the Cardinal clinical features of CES. Seven patients had been confirmed as complete by clinical and imaging studies while three patients showed incomplete clinical features, their age range between 37 to 70 years Six patients had decompression laminectomy at L3, L4, L5 for a spinal stenosis and four patients had discectomy at L4-L5, L5-S1. One patient with retrolisthesis and stenosis had fixation at L3-L5. Table 1 shows the details of preoperative clinical and imaging studies while table 2 shows the surgical procedure and postoperative findings

**Table1: Preoperative Clinical and Imaging studies in 10 patients with CES after spinal surgery**

Patient No.	Sex	Age in Years	Symptoms	Sacral Symptoms	Neurological signs	MRI findings
1.	M	35	Radicular pain L4-L5	Non	Not recorded	Disc L4-L5 (R)
2.	M	65	Claudication, back pain	Non	Not recorded	Spinal stenosis L3_L4/ L4-L5
3.	F	60	Claudication, Back pain	Non	Not recorded	Spinal stenosis L3_L4/ L4-L5
4.	M	35	(R) radicular pain Backpain	Non	Not recorded	Disc L4-L5 (R)
5.	M	70	Claudication, Back pain	Non	Not recorded	Severe spinal stenosis L3-L4 /L4-L5
6.	F	54	Back pain, walking difficulties	Non	Not recorded	Severe lumbar canal stenosis L4-L5 with retrolisthesis
7.	F	34	Back pain, (L) radicular pain	Non	Not recorded	Big central disc L4-L5
8.	F	50	Paresthesia, claudication, back pain	Paresthesia	Not recorded	Severe spinal stenosis L3-L4 /L4-L5
9.	F	38	(L) radicular pain, back pain	Non	Not recorded	Disc prolapse L5-S1
10.	F	68	Claudication, Back pain, paresthesia	Paresthesia	Not recorded	Severe Lumbar canal stenosis L4-L5

N.B patients No. 3, 7, 10 had comorbidities: Diabetes and Hypertension

Nine patients had decompression with or without discectomy. Only one patient had retrolisthesis with stenosis, had decompression with fixation. The time to detect postoperative CES varies between 48 hours and seven days. Three patients had dural tear due to severe canal stenosis and adherent disc difficult to separate and one patient with disc L4-L5, the disk was removed after excessive traction on the root and the dura. In two patients, no obvious cause was discovered, all imaging and investigations were negative so no re-exploration was done

while the causes of postoperative CES were identified prior to re-exploration, was hematoma in two patients. Incomplete widening of the central decompression, widening of the lateral recess, decompression for L1-L2/L2-L3, which was missed, repair in three cases of dual tear which was missed, irrigation with normal saline was done to all patients, Tachosil patch was also applied to seal the tear, and bone wax was applied on the open surface of the remaining part of the lamina to reduce bleeding. (Table 2).

**Table 2: Surgical procedure and post-operative surgical findings**

Patient No.	Surgery	Surgical complications	New somatic symptoms	Later intervention
1.	Discectomy	Not reported	R leg cramps, back ache, motor weakness, both lower limbs saddle anesthesia	Immediate surgery and removal of retained spongicele
2.	Decompression L3-L4/ L4-L5	Excessive bleeding	Motor weakness, urinary retention, no erection	Widening of the decompression
3.	Decompression L3-L4/ L4-L5	Prolonged surgery Dural tear	Paresthesia, L.L. weakness, back ache , urinary retention	Urgent decompression and clearance
4.	Discectomy L4-L5	Difficulties in removing the Disc/ excessive traction	Motor weakness, urinary retention, saddle anaesthesia	Urgent laminectomy and clearance
5.	Decompression L4-L5	No complications	Motor weakness, radicular pain, urinary retention	Laminectomy, clearance, widening of the L. recess
6.	Spinal fixation L3-L4- L5	not reported	Motor weakness both lower limbs	Conservative Rx
7.	Disc evacuation	Not reported	Back pain, radicular pain, saddle anesthesia	Conservative Rx
8.	Decompression L3-L4/ L4-L5	Dural tear Excessive bleeding	Saddle paresthesia, urinary retention, LL weakness	Re-exploration, clearance
9.	Discectomy L5-S1	Not reported	Urinary retention, weakness both LL	Re-exploration, removal of disc fragment
10.	Decompression L4-L5 / L5-S1	Dural tear Excessive bleeding	Urinary retention, saddle anestheisa	Decompression of L1-L2/ L2-L3

Comorbidities worsen this situation, it was noticed in patients number 3, 7 and 10 in form of hypertension and diabetes, also the risk of CES is more in old age than in young and more with canal stenosis than with disc prolapse. We cannot ask about the sexual life in women because it is not possible in our locality. The outcome of early detection and urgent treatment is definitely superior to late diagnosis and delayed re-exploration. In two patients no re-exploration was done because of negative results of imaging and investigation so almost probably it is related to ischemic changes and root oedema, for this reason,

all patients receive dexamethasone 8 mg eight hourly for three days, hoping that will ameliorate the condition and hasten recovery.

The follow up for the patients extended from 8 months to 5 years, sadly none of our patients achieved full recovery and back to normal life, all of them ended up with some residual deficit like lower limb weakness, chronic urinary problems or sexual dysfunction. Table 3. Shows the details of long-term postoperative outcome for the 10 patients with postoperative cauda equina syndrome.

**Table 3: Long term post-operative outcome in 10 patients with postoperative cauda- equina syndrome**

Patient No.	Motor power	Sacral sensation	Bladder function	Bowel function	Sexual dysfunction
1.	3/5	Normal	Retention/ occasional	Normal	Normal
2.	4/5	Almost normal	Stressful micturition	Constipation	Decreased erection
3.	5/5	Almost normal	Normal	Normal	?
4.	5/5	Normal	Almost normal	Lack of flatus control	Decreased erection
5.	4/5	Impaired	Stressful micturition	Normal	Decreased erection
6.	5/5	Normal	Periodic catheterization	Normal	?
7.	5/5	Almost normal	Stressful micturition	Lack of flatus control	?
8.	3/5	Normal	Normal	Constipation	?
9.	5/5	Mild paresthesia	Almost normal	Lack of flatus control	?
10.	4/5	Mild paresthesia	Incontinent	Incontinent	?

(?) because in our locality it is shameful to ask about sexual life in females.

Eight Patients had re-operation as soon as possible to achieve the best outcome possible.

All patients included in this study had a period of at least six weeks in the physiotherapy department; physiotherapy helps to some extent particularly in improving muscle power.

**Discussion:**

Postoperative cauda equine syndrome, partial or complete represents a medical emergency, especially if they are progressive (Randy L). (16)

The syndrome was recorded as complication in small series of lumbar spine surgery. Our percentage of postoperative CES is 0.9% (10 out of 1105 patient with spine surgery while the literature sites mention the incidence of postoperative cauda equina as being rare between 0.08% and 0.2%. (Randy L. Jensen). (16) This obviously indicates that our percentage is higher than the reported, probably this is related to our facilities. Jan, William Duncan etal. (14) reported this syndrome to occur in 2.8% of the decompression for spinal stenosis, this supports our results, this syndrome was recorded more following spinal stenosis than following disc.

Alan Gardner (2) mention that around 50 to 70% of patients have urinary retention on the presentation with 30 to 50% having incomplete syndrome this is in agreement with our results. Scattered case report was published about post operative CES like recurrent disc Kimley. (17) We have one case of missed disc fragments discovered after re exploration. Motohiro (7) reported one case of post operative CES caused by engorgement of the ventral epidural plexus. Migration of the adipose tissue flap, following lumbar laminectomy was recorded by Urvoy. (18)

Henriqus T. (19), reported CES due to Venous engorgement caused by pre-existing missed spinal stenosis after lumbar discectomy.

Jan William Duncan (14) concluded that CES was the result of dural tension on the lumbosacral nerve root secondary to dural expansion following decompression, resulting in root ischemia. More other causes were mentioned in the introduction.

All our patients with confirmed diagnosis had re-operation done as soon as possible. All had intravenous dexamethasone 8 mg eight hourly for three days, we feel it help in reducing root oedema. We did not have any complications from this regimen. In contrast to our urgent re-exploration Asaad Qureshi. (20) did not consider early re-operation superior to delayed operation, he confirmed no statistically significant difference in outcome, he considered the severity of bladder dysfunction at the time of surgery is the dominant factor in recovery of the bladder function. Randy L. (16) share our feeling about urgent surgery. He said urgent decompression seem to translate into the best return of function.

Endoscopic discectomy has been used by Krishnan (21), he said that endoscopy can be considered for the treatment of CES, also Lia Ankang (22) used the same procedure, and he compared full endoscopic to open laminectomy, He claims almost similar results.

AbdulMaksood (23), used a minimally invasive microdiscectomy on 12 patients claiming complete recovery of CES, he is the only one claiming complete recovery after surgery. In all our cases, we performed open decompression, we are not convinced with keyhole surgery for cauda equina syndrome because we feel the CE roots need space to expand and recover.

Randy (16) reported two cases of CES, one after microdiscectomy and the second after open surgery, he supported our idea of urgent open decompression, and in our four patients we did open re-decompression to widen the canal or lateral recess.

Vassilios (24) used somatosensory evoked potentials monitoring during surgery, claiming that is useful for early

detection of CES, but he mentioned further validation is required. We have no experience in this practice.

Utmost handling the dura and roots is very vital, excessive traction should be avoided and the dura should not be pushed beyond the level of spinous process, one patient in our study had CES because of excessive traction on the root because the disc was adherent to root and the Dura, two patients ended up with postoperative extra dural hematoma.

Control of the bleeding spot is very vital. We found the application of bone wax on the open surface of the bone will reduce to some extent the hematoma collection.

Sadly, one patient has CES because of retained spongicle, which becomes a ball like pressing on the dura. All disc fragments should be removed particularly with ruptured disc, hidden disc fragment was a cause in one of our patients, satisfactory central and lateral decompression was vital in our patients. We widen the canal in the re-exploration.

The utmost care and proper handling technique at the time of first surgery will definitely reduce the incidence of post operative CES, because most of the causes in our study were preventable from the start, still, we cannot abolish postoperative CES, it may occur with or without reason.

McLaren AC (1) reported six cases of acute CES post discectomy, five patients had coexisting spinal stenosis at the level of disc herniation not decompressed initially, inadequate decompression played a role in neurological deterioration, so proper decompression leads to a much better outcome.

Better to avoid the halfway surgery, so the associated spinal stenosis with disc should be discovered prior to surgery by routine measurement of spinal canal.

CES is traditionally accepted to be the result of compressive neuropathy, but in two of our patients, we could not confirm any compression by imaging studies so re-exploration was not done.

It has been put a forth that tension not compression and the subsequent ischemic effect on the spinal cord microcirculation may lead to postoperative CES (Lunborg). (25)

It has been shown that there is an area of hypo vascularity below the tip of conus medullaris, which is a very vulnerable to dural tension of nerve root potentially inducing root ischemia leading to CES. (Jensen L.Randy). (16)

We repaired three dual tears, because we felt they contribute to cauda equina syndrome.

Yohei kakuta. (12) reported one case of trans dural cauda equina herniation after uneventful lumbar surgery, re-operation was performed for herniation of nerve root, so we have to be aware of this very rare possibility, even if no dural tear was identified intra-operatively.

Re exploration may be required if the symptoms progress and the disease origin is not clear based on clinical features, investigations and imaging.

All our patients had intensive course of physiotherapy for at least six weeks and obvious improvement was noticed particularly in muscle power. This is in agreement with pranali sunil (26), who confirmed in his paper that post operative physiotherapy showed significant improvement and used to prevent secondary complications.

Table 3, shows the details of post operative outcome, obviously none of our patients was back to normal life, they improved, but some symptoms remained. This is in agreement with J. E. Hazelwood report (27), but not with the report of Abdulmaksood who claims 100% recovery in all symptoms.

Nisaharan (28) after a literature review, his conclusion was there is significant heterogeneity in the outcome reported for studies after surgery for CES patients.

key yeol lee (29), gave the conclusion that the less the motor loss and the voiding difficulty before secondary decompression and the faster diagnosis and surgical decompression, the better the prognosis in particular as avoiding difficulty showed lowest recovery rate, it is considered to affect the prognosis and satisfaction.

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