Guidelines for Cauda Equina Syndrome Management

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The cauda equina syndrome (CES) is an urgent situation which needs immediate surgery. However, proper diagnosis is often confused. There are some clinical check points; bilateral radiculopathy, impaired perineal sensation, impaired anal tone, and urinary retention. In addition, magnetic resonance image should match the clinical symptom. With these clinical and radiographic evidences, we can classify CES as CES suspected or suspicious (CESS), incomplete CES (CESI), and CES with neurogenic retention of urine (CESR). All these situations may need surgery, however, the timing of surgery and neurologic outcomes are various. Herein we prescribe the guideline for proper treatment strategy of CES.

Keywords: Cauda equine syndrome; surgery; radiculopathy; urinary retention

INTRODUCTION

Cauda equina is a bundle of spinal nerves which begins at the end of spinal cord, the conus medullaris. At birth, conus medullaris locates at L3 level, however as the vertebra grow, it shift to cranial portion around L1 to 2 approximately. When mechanical or chemical neural bundle damage occur between L1 to S1 level, multiple lumbosacral symptoms may develop, and we call this cauda equina syndrome (CES). This is an urgent situation and mostly needs direct decompression. However, CES symptoms range diverse so that diagnosis are often uncertain. Therefore many clinicians sub-classified the CES as CES suspected or suspicious (CESS), incomplete CES (CESI), and CES with neurogenic retention of urine (CESR). Despite these efforts, precise treatment planning for CES is not clarified.

Etiology of CES

Disc herniation

Disc herniation is the most common cause of CES and often

requires acute surgical decompression^{1,8,9)}. Most common site is L4/5 where the disc herniation is most frequent. Acute and massive nucleus pulposus herniation occur chemical irritation and mechanical compression to neural tissue. In majority cases of disc herniation, conservative treatments are performed previously. However, in definite CES, immediate removal of disc fragment is mandatory.

Spinal stenosis

Spinal stenosis is most common etiology for thecal sac compression in elderly. However, the symptomatic CES appears only in minor group. It is because the progress of spinal stenosis is slow, the neural tissue has chance for compensation in such condition. Nevertheless, progressive symptomatic spinal stenosis could occur CES so it should be treated in appropriate time. Spondylolisthesis is associated with stenosis in clinical view and also risk factor of CES.

Trauma

Vertebral fracture could lead to CES. Vertebral body fracture with canal encroachment, laminar fracture, disc rupture, hematoma can compress thecal sac and cause CES. Immediate correction is needed⁷⁾.

Spinal tumor

Primary or metastatic spinal tumor could compress thecal sac and generate CES. Incidence widely, metastasis are more frequent than primary tumor. In this case, patient life expectancy, operation acceptability, primary cancer origin, medical comorbidity should be concerned precisely. Accurate evaluation and fast decision making are necessary for the operation.

Spondylitis

Tuberculous spondylitis and pyogenic spondylitis often accompany epidural abscess and pathologic fracture. These conditions could compress thecal sac and lead to CES. Appropriate anti-tuberculous or anti-biotic treatment should be performed parallel with surgical treatment.

Neuro-inflammatory disease

Autoimmune disease as ankylosing spondylitis, lumbosacral plexopathy, demyelinating polyneuropathy, and acute transverse myelitis could occur symptom mimicking CES. These are not an operative conditions but a medical treatment should be performed¹⁰⁾.

Chemical neuritis

After epidural block or spinal anesthesia, CES like symptom could occur. This is not a surgical situation. Conservative managements are recommended.

Clinical manifestation of CES

Low back pain

Usually, pathogen is developed suddenly at lumbar spine. Therefore, low back pain is frequent symptom in CES. However, it is not considered as critical sign of CES, because back pain is a common symptom in various situations and it is not a direct evidence of severe neural damage.

Radiculopathy

Bilateral low extremities radiculopathy is one of the most important symptoms of CES. The sensitivity of bilateral radiculopathy for CES diagnosis is very high, however the specificity is not valuable. Unilateral radiculopathy is less common in true CES^{2,4)}.

Impaired perineal sensation

Impaired perineal sensation is so called saddle anesthesia. It is representative CES symptom with high sensitivity and specificity. However, as the symptom is sensory impairment, physicians have to rely upon patient's subjective reply. Therefore, the objective reliability of saddle anesthesia is often controversial²⁾.

Decreased anal tone

Impaired anal tone is one of the most objective symptoms of CES. If the fecal incontinence is accompanied, extreme alertness is needed⁶⁾.

Urinary retention

Urinary retention or incontinence is the most reliable clinical symptom of CES. This is the red flag sign of CES and immediate decompression is necessary. This is also a risk factor of bad outcome and in most cases, neurologic impairment remains even though immediate decompression has been held¹²⁾.

Radiographic evaluation

Magnetic resonance image (MRI)

MRI is the single most reliable image study for CES diagnosis. If there is reliable clinical symptoms of CES and a lesion of thecal sac compression with no cerebrospinal fluid (CSF) space, CES is strongly suggested and immediate surgical decompression should be performed³⁾.

Computed tomography (CT)

Single CT scan is not recommended for CES diagnosis. However, in situation who cannot receive MRI scan, CT could be an alternate. In this case, CT myelography could give better information.

X-rays

X-rays could give only indirect information. Diagnosis of CES with X-ray only is not recommended.

Electrophysiology test

Electromyography has excellent specificity. The test should include S2-3 myotome, which indicates anal tone impairment. However, in majority cases of CES, the symptom onset is abrupt. Approximately, EMG is sensitive after 2 or 3 weeks after clinical onset. Therefore, there could be no time to wait for EMG test in many cases of CES⁵⁾.

Classification of CES

In case of chemical irritation or inflammatory condition, direct surgical decompression is unnecessary. Therefore we consider as

definite CES only in both clinical symptoms and MRI diagnosis are satisfactory. Thecal sac compression with bilateral radiculopathy and/or subjective sphincteric problems and/or subjective perineal sensory changes with no objective evidence of CES is CESS (CES suspected). Thecal sac compression with subjective symptoms and objective signs of CES is CESI (incomplete CES). Thecal sac compression with neurogenic urinary retention is considered as CESR (CES with retention)¹²⁾.

Surgical timing and outcome of CES

CESS

Elective surgery is preferred rather than emergency surgery. The diagnosis could be wrong and even though it was true CES, radicular pain mostly recover up to 85% with normal bladder function after surgery. EMG could be helpful in such cases¹¹⁾.

CESI

Majority of patients with CESI have normal or socially normal bladder and bowel after surgery. Sexual function may decrease. If the MRI findings are positive and clinical symptoms indicate CESI, surgical procedure should be performed as soon as possible¹¹⁾.

CESR

There should be no delay for surgical decompression. Direct surgery is the only option in this situation. The patients are often paralysed, have insensate bladder/bowel, and usually no sexual function are remained¹¹⁾.

CONCLUSION

The CES is an urgent situation which needs direct decompression and has various etiology, representatively, disc herniation. Meticulous diagnosis is most important for the treatment planning. Clinical symptoms should be concerned for the first step and then, MRI finding should match the symptoms. EMG could be helpful in CESS or CESI. In definite CES as CERS, surgery should be performed immediately.

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CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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