

# Acute Cauda-Equina Syndrome (CES)

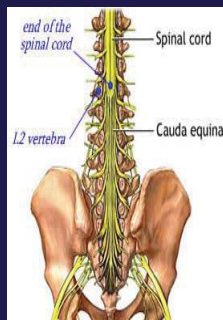


新光醫院 急診科  
張志華 醫師

## Objectives:

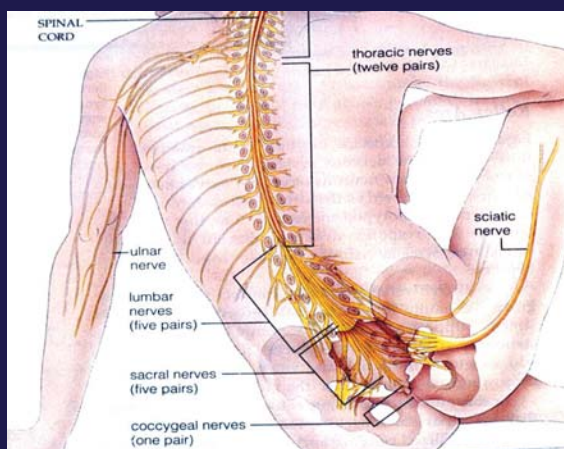
- Describe Cauda Equina anatomy
- List symptoms associated with CES
- Discuss CES diagnostic procedures
- Detect “red flags” of CES

## Horse's Tail Cauda Equina



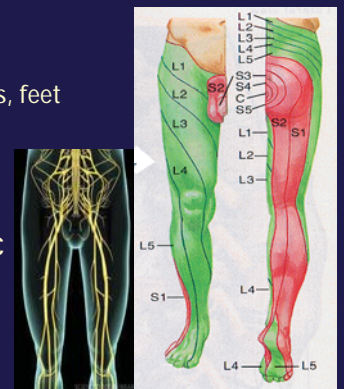
## Cauda Equina:

Group of sensory and motor nerve roots that arise from the end of the spinal cord (conus medullaris) extends inferiorly & intradurally towards coccyx.



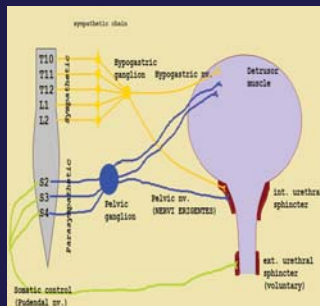
## Cauda Equina Provides:

- Motor
  - hips, knees, ankles, feet
  - sphincters
- Sensory
  - “saddle region”
- Parasympathetic
  - bladder
  - distal bowel



## Parasympathetic Innervation

- S2-4 : bladder wall
  - constriction of muscular wall of bladder
  - Relaxes sphincters

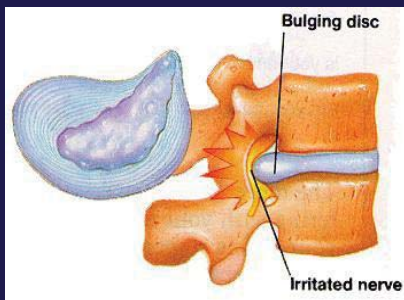


## Incidence of CES

- ~ 3/10,000 low back pain (U.S.)
- Detection
  - history and PE
  - TRAUMA

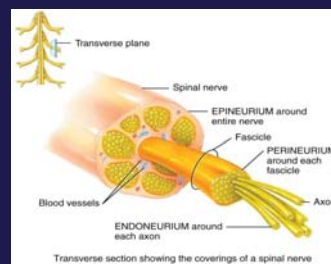
## Pathophysiology of CES

- Nerve roots compression



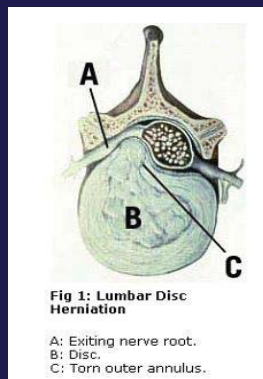
## Pathophysiology of CES

- Proximal nerve roots – relatively hypo-vascularized



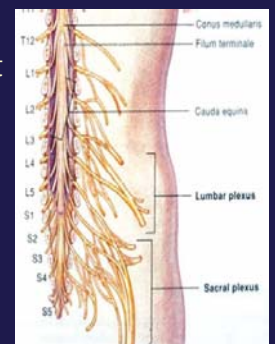
## Nerve Root Compression

- Tumor
- Trauma
- Spinal EDH
- Infection
- Ruptured vertebral disc

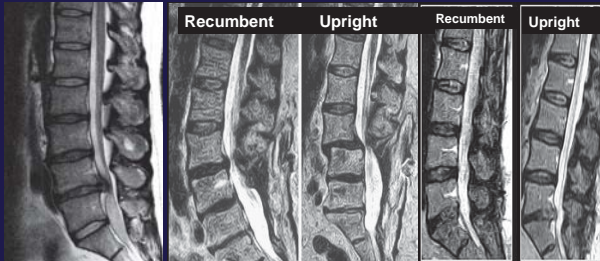


## CES & HIVD

- Variable S/S = level of involvement
- Most common: L4-5 (57%)
- Most common: males age 30-40 with prior history of LBP
- Most common sm: LBP > 90%

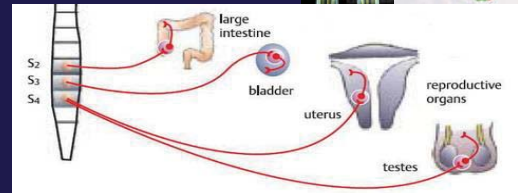
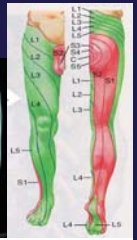


## CES & HIVD



## Acute CES

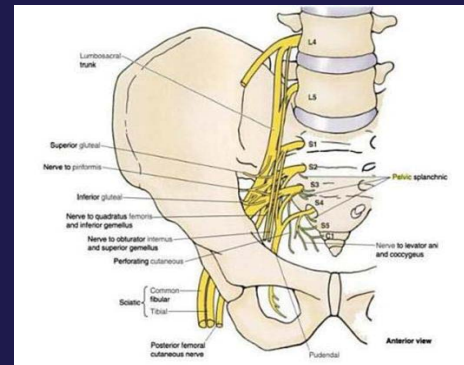
- Bilateral sciatica
- Urinary retention
- Saddle anesthesia
- Reduced sphincter tone
- Lower limb weakness



## Acute CES

- Immediate referral for MRI or CT
- Neuro-surgical consultation

## CES: Motor Weakness

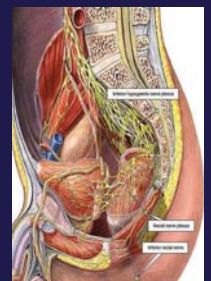


## CES: Motor Weakness

- Can be severe, usually involves more than single nerve root
- May be bilateral, but rarely symmetric
- Untreated motor weakness can become permanent disability
- Can progress to complete paralysis / paraplegia
- Reflexes are HYPO-active
- No long tract signs

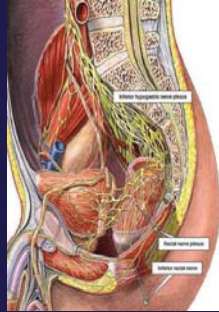
## CES: Urinary Retention

- The most consistent sign in CES (incidence ~ 90%)
  - Check post-void residual – normal = 50 - 100 mL
  - **>200 mL = retention**
  - **Overflow incontinence** can be seen as the bladder fills



## CES: Anal Tone ↓

- Anal sphincter tone diminished in 50-75%
  - Fecal incontinence
  - Fecal impaction



## CES: “Saddle anesthesia”

- The most commonly observed sensory deficit in CES (~ 75%)
- Sensory loss seen around the **anus, lower genitalia, perineum, buttocks**, sometimes even the **posterior thighs**

Patient Name \_\_\_\_\_ Date/Time of Exam \_\_\_\_\_  
 Examiner Name \_\_\_\_\_

**ASIA STANDARD NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY**

**MOTOR**  
 KEY MUSCLES (grouped on same side)  
 C5 Elbow flexors  
 C6 Wrist extensors  
 C7 Elbow extensors  
 C8 Finger flexors (superficial muscles of middle finger)  
 T1 Finger abductors (deep finger)  
 UPPER LIMB TOTAL (200) (200) (200)

**SENSORY**  
 KEY SENSORY POINTS  
 C2-3 mentum  
 C3-4 jawline  
 C5-6 axilla  
 C7-8 radial wrist  
 T1-2 medial hand  
 T3-4 lateral hand  
 T5-6 medial thigh  
 T7-8 lateral thigh  
 T9-10 medial calf  
 T11-12 lateral calf  
 L1-2 medial malleolus  
 L3-4 lateral malleolus  
 L5-6 lateral foot  
 S1-2 lateral heel  
 S3-4 medial heel  
 S5-6 lateral heel  
 Lower limb total (200) (200) (200)

**Key Sensory Points**

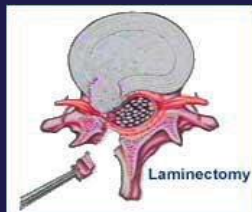
**NEUROLOGICAL LEVEL:** COMPLETE OR INCOMPLETE? ASIA IMPAIRMENT SCALE

## CES: “Red Flag”

- saddle anesthesia
- bilateral radiculopathy (sciatica)
- bilateral leg weakness
- urinary retention and overflow incontinence
- fecal incontinence
- sexual dysfunction

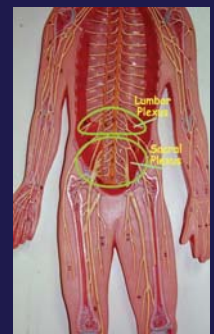
## Is Acute CES an Emergency?

- Yes
- OP:
  - wide laminectomy + extensive decompression
- When to operate?



## Is Acute CES an Emergency?

- Goal: surgery within 24 hr of presentation / diagnosis if at all possible  
 (DeLong et al. 2008) (Olivero et al. 2009) (Gettleman 2008) (Duffy, R.L. 2010)



## When to operate?

- Meta-analysis (Johns Hopkins, 2000, total 332 pts)
- CES secondary to lumbar HIVD
- Significant improvement in outcome for patients operated on within 48 hr of onset of symptoms  
*(DeLong et al 2008)*

## CES Prognosis

- Shapiro, et al:
  - surgery within **48 hrs** of sm onset, **95%** recovered continence and normal function within **6 m**
  - surgery delayed beyond 48 hrs, **63%** still required catheterization after 6 m
- Sequence of improvement
  - pain,
  - motor
  - autonomic signs

## Sexual & Fertility Issues

- Should seek consultation:
  - Men → urologist
  - Women → obstetrician or gynecologist

## Acute CES Summary

- **CES is a surgical emergency!**
- Compression below **L3** sensory & motor nerve roots: **HIVD**, trauma, tumor, EDH, infection
- **LBP, urinary retention**, saddle anesthesia, reduced sphincter tone, bilateral sciatica, weakness
- Timely **MRI**
- Timely **NS** consultation

## CES: keep in mind

- Variable presentation
  - Misdiagnosis
  - Delayed diagnosis
- Medico-legal problems
  - Permanent sequela
  - Young population

## Acute CES: “Red flags”

- **Sensation**
  - LBP, sciatica
  - “saddle anesthesia”
- **Strength**
  - Paraparesis / paraplegia
- **Sphincter**
  - Bladder: urine retention / overflow incontinence
  - Bowel: fecal incontinence
- **Sexual dysfunction**