

# Tethered Cord Syndrome

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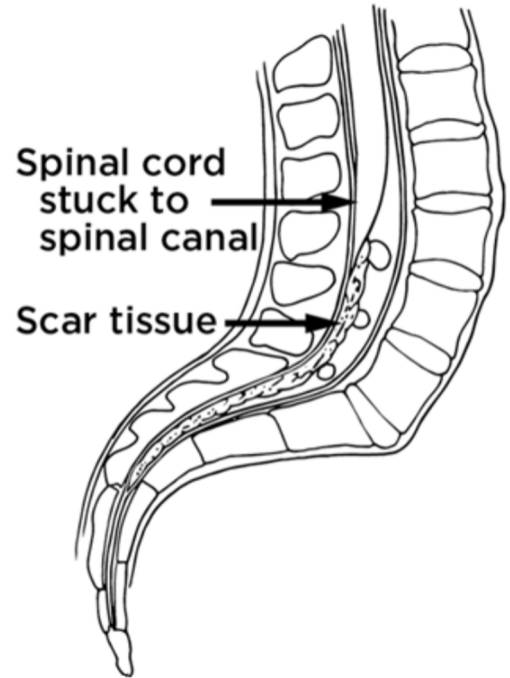
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# Learning Objectives

- I. Understand the anatomical pathology that defines a tethered cord
- II. Understand the typical presenting symptoms of a tethered cord
- III. Understand the relevance of the physical exam for a tethered cord
- IV. Understand the required imaging for a tethered cord
- V. Understand the co-management and appropriate referral for a tethered cord

# Etiology of Tethered Cord Syndrome (TCS)

- Form of spinal dysraphism where the spinal cord is “stuck” to a structure within the spine such as the dura, scar tissue, a bony spicule, or tumor
- Limits the movement of the spinal cord within the spinal column
- May be congenital or acquired
- Rare in adults
- Result of improper growth or failure of closure of the neural tube during fetal development



# History

- 1857 lipoma of spinal cord in a child; 1891 Jone performed detethering
- 1976 Hoffman
- Radiographic diagnosis of low conus and thickened filum: excluding other conditions that also tether the cord.

# Embryology

- Primary neurulation: lack of closure of neural groove: the level of final closure of the caudal neuropore corresponds to S2, suggesting malformations above sacrum are due to failure of primary neurulation
- Secondary neurulation below somite 31; s2 AND BELOW SUCH AS CAUDAL AGENESIS: filum terminale forms as a gliopendymal strand during retrogressive differentiation as conus ascent occurs
- CONUS ASCENDS: day 43-48: differential growth of vertebra and corresponding neural segments, regression of caudal cord; ends up around L1-

# Symptoms of TCS

- Classic Symptoms:

- Back pain
- Pain, weakness, numbness in lower extremity
- Scoliosis
- Lesion on the lower back
- Incontinence
- Frequent UTI
- Urinary frequency

- Other Symptoms:

- Difference in leg strength
- Lipoma
- Rapid leg atrophy
- Hypertrichosis
- Nevus
- Trophic ulcerations of the legs and feet

# Physical Exam Findings & Relevance

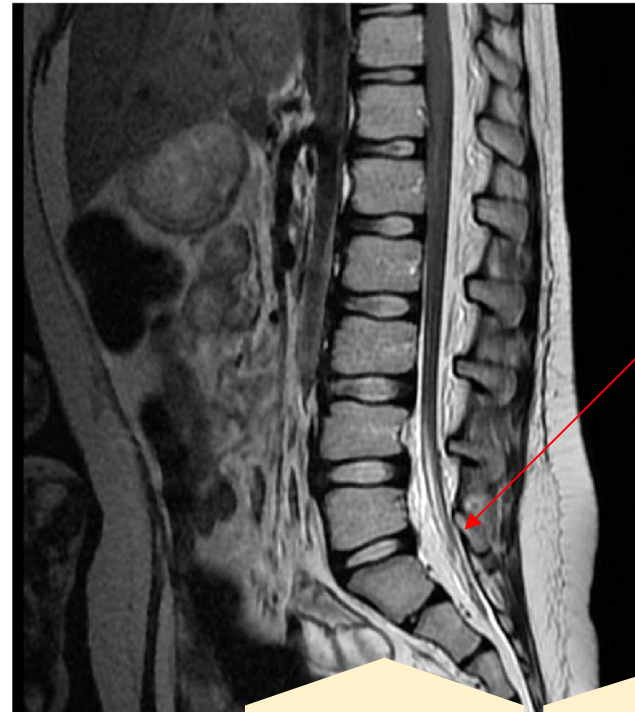
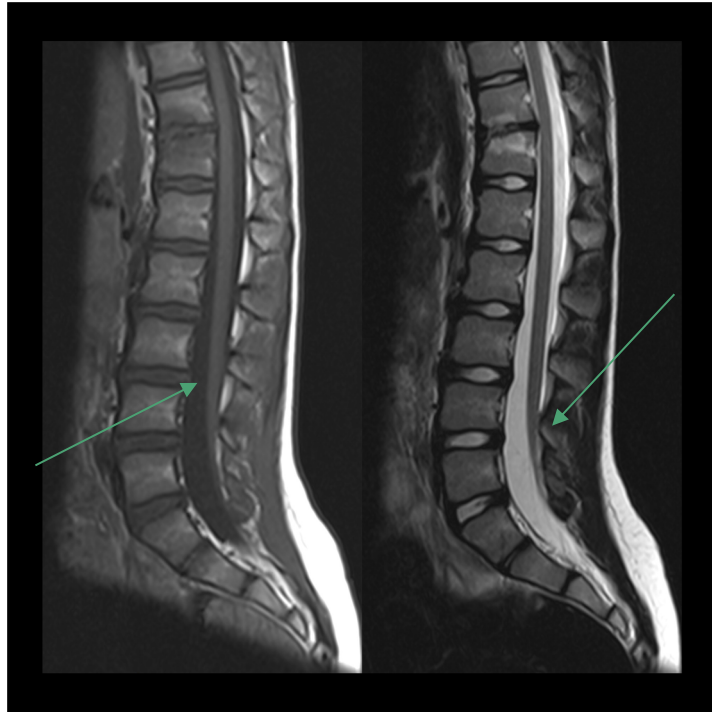
- Back pain aggravated immediately on flexion of the lumbosacral spine
  - Bending slightly (over the sink)
  - Buddha sitting with legs crossed
  - Baby holding at the waist level
- Cutaneous manifestations - hairy patch, hemangioma, dimple, lumbosacral mass
- Asymmetric motor and sensory dysfunction, painless foot burns (trophic ulcerations), hyperreflexia
- Clubfeet (equinovarus), asymmetry in leg length, trophic ulcerations, atrophy of lower leg muscles
- Gait change

# Additional Testing: Urodynamics

- Functional Bladder Test
  - Measures storage, emptying, EMG, video fluoroscopy
  - Abdominal leak point pressure
- Positive for hyperreflexia
  - external detrusor-sphincter dyssynergia (DSD)
- Decreased sensation
- Decreased compliance
- Hypocontractile detrusor



# Imaging for Tethered Cord: MRI



# Diagnosis Criteria

- Back pain aggravated by bending slightly forward, sitting upright with crossed legs, holding moderate weight at waist level
- Thickened filum terminale on the MRI
- Urology workup
- EMG to assess nerve function
- X-rays to identify bony abnormalities

# Management of a Tethered Cord: Conservative

- Therapy and Pain Management if no neurological symptoms
- Aquatic Therapy
- Soft Tissue Care

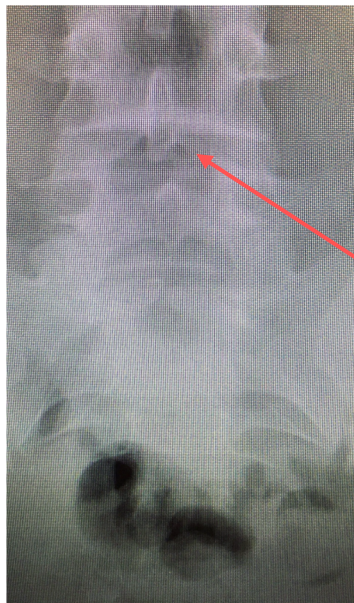


# Management of a Tethered Cord: Surgical Interventions

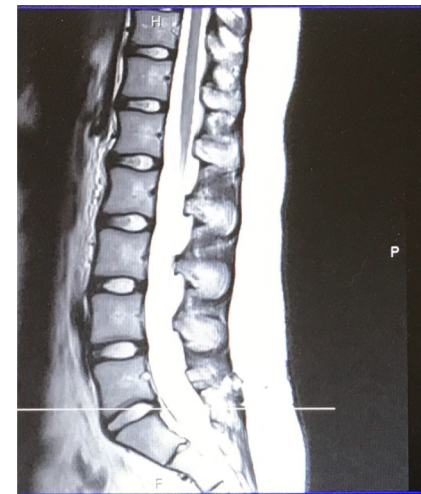
- Principle procedures & Methods
  - Laminectomy - remove parts of the vertebrae then free the spinal cord by cutting it away from the scar tissue
  - Repairing the myelomeningocele or removal of scarring formation/ mechanical Neurolysis
  - Section of the spinal cord or root fibers to relieve severe back and leg pain
  - Shortening on the spinal column by resection of one of two vertebrae to relieve spinal cord tension
  
- Detethering spinal cord: transection of filum terminale: Intraoperative Neuromonitoring essential!!!

# Case Studies - Patient KW 20 y.o F

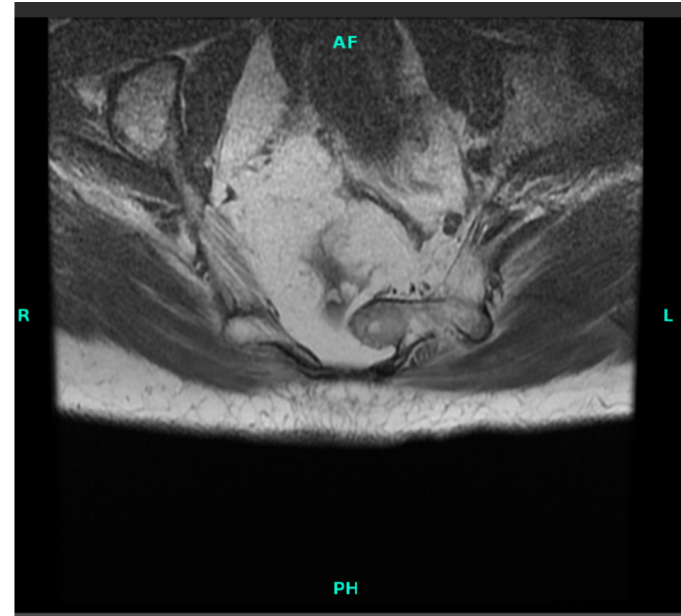
Pre-Op



Post-Op



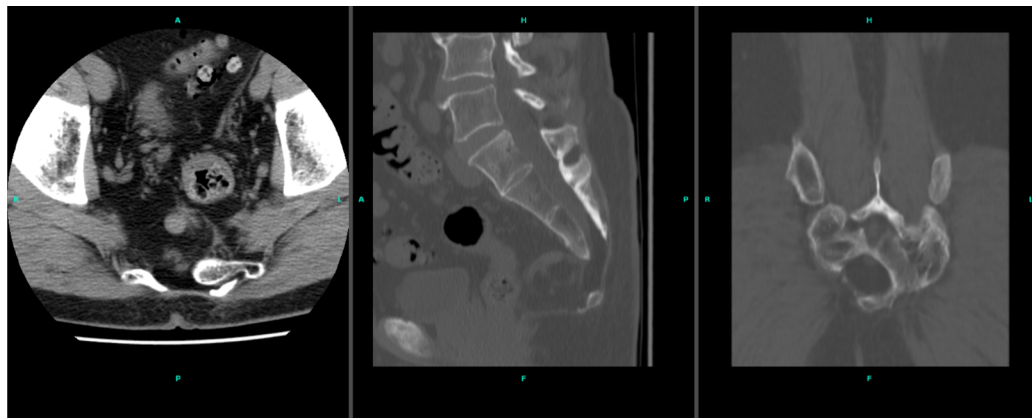
# Case Studies - Patient JE 60 y.o M



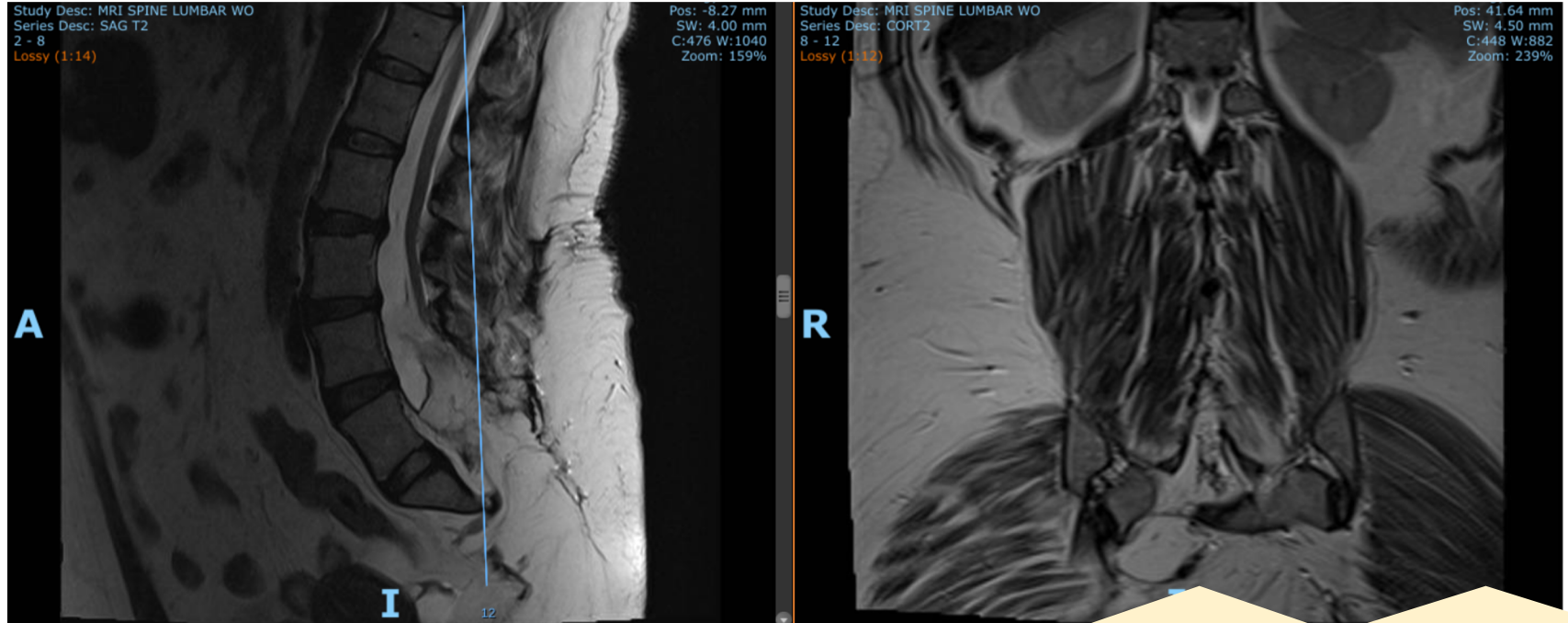
# Case Studies - Patient JE 60 y.o M

Local pain

Unable to sit due to pain

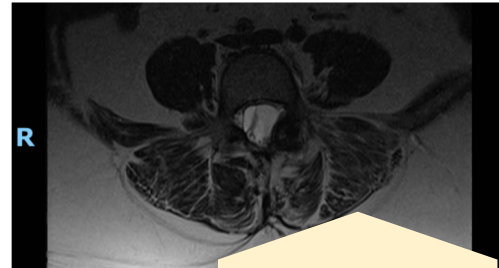
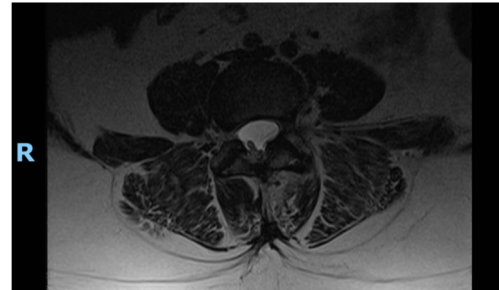
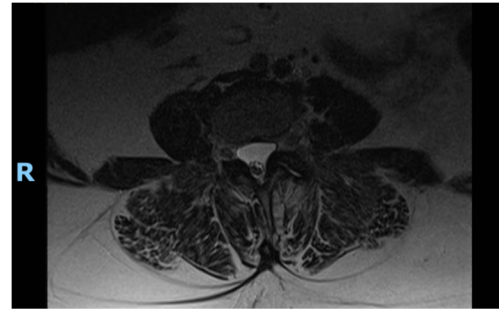
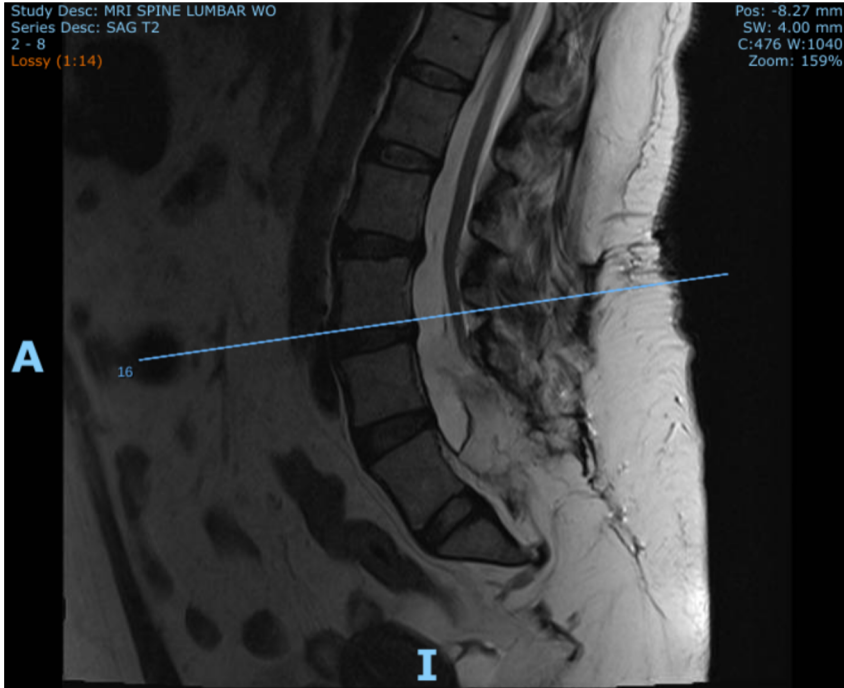


# Case Studies - Patient KS 42 yo F with prograssive back and leg pain





# Case Studies - Patient KS



*Thank you!*  
*Any Questions?*

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