Lesions of the spinal cord
Spinal cord lamination
Complete spinal cord transection (Transverse myelopathy)

- All ascending tracts from below the level of the lesion and all descending tract from above the level of lesion interrupted.
- Motor, sensory, autonomic functions below the level of lesion disturbed.
- Causes: traumatic spine injuries
tumour
multiple sclerosis
vascular disorders
spinal epidural hematoma/abscess
auto immune disease
herniated intervertebral disc
parainfectious/post vaccinal syndrome
Sensory disturbances:
- soft touch, pain, temperature, position, vibration impaired below the level of lesion
- band like radicular pain/segmental paraesthesia at the level of lesion
- localised vertebral spine pain- destructive lesions

Motor disturbances:
- paraplegia/quadriplegia
- acute- flaccid/areflexic-spinal shock
- latter- hypertonic/hyper reflexic, loss of superficial reflexes, babinski +, flexor/extensor spasm
- extension of hip, knee occurs in high spinal & incomplete lesion
- flexion of hip, knee occur in low spinal & complete lesion
- at the level of lesion – paresis, atrophy, fasciculations, and areflexia (LMN signs) in a segmental distribution because of damage to the anterior horn cells and ventral roots
  - Autonomic disturbances:
    - initially atonic, latter spastic bladder, rectal sphincter disturbances
    - orthostatic hypotension
    - trophic skin changes
    - anhydrosis
    - impaired temperature control
    - vasomotor instability
    - sexual disturbances
    - I/L horner syndrome
Hemisection of the spinal cord (Brown-Sequard Syndrome)

- Loss of pain, temp C/L to the hemisection - interruption of crossed spinothalamic tract
- I/L loss of proprioception – interruption of ascending fibers of posterior column
- I/L spastic weakness due to interruption of descending corticospinal tract
- Segmental LMN signs and sensory changes at the level of lesion due to damage of the roots and anterior horn cells at the level of lesion
Central spinal cord lesion

- Spinal cord damage starts centrally and spreads centrifugally
- Decussating fibers of spinothalamic tract involved initially
- Thermo anaesthesia, analgesia a "vest like" or "suspended" bilateral distribution with preservation soft touch sensation and proprioception---dissociation of sensory loss
- Forward extension of disease
  anterior horn cells inv- segmental neurogenic atrophy, paresis, areflexia

- Lateral extension
  I/L horner syndrome
  kypho scoliosis
  spastic paralysis

- Dorsal extension
  I/L position sense, vibratory loss

- Extreme venterolateral extension
  thermo anaesthesia, analgesia with sacral sparing

- Neuropathic arthropathy

- Pain
Acute cervical central spinal cord syndrome

- Severe hyper extension injuries of neck
- Pt becomes quadriplegic after trauma, and regains strength in hours even in mnts
- Urinary retention
- Patchy sensory loss below the lesion
- Weakness more in arms, more distal than proximal
- “man in a barrel syndrome”
- Considerable recovery
- Due to damage of central grey matter, lateral cortico spinal tract at cervical enlargement
Postero lateral column disease

- SACD- B12 def
- Vacuolar myelopathy- AIDS-HTLV 1, tropical spastic paraparesis
- Cervical spondylosis
  - paraesthesia, difficulty with gait, balance, loss of vibration and proprioception, sensory ataxia, rombergs +, bladder atony, reflexes lost or hypo active – super imposed peripheral neuropathy
Posterior column disease

- Tabes dorsalis- tabetic neuro syphilis, progressive locomotor ataxia
- Impaired vibration and position sense, and decreased tactile localisation
- Lability of mechanical sensation threshold, tactile & postural hallucinations, persistence of mechano receptor sensation, disturbances in the knowledge of extremity movement and positions (temporal & spatial disturbances)
- Sensory ataxia in dark, romberg +
- Ataxic / stomping/ double tapping gait
- Positive sink sign
- In tabes dorsalis- lancinating pain, urinary incontinence, -ve patellar and ankle DTR, hypotonic limb, hyper extensible joints abdominal, laryngeal crises
- Abadie’s sign, impaired light touch perception in hitzig zone
- Argyll robertson pupil, optic atrophy, ptosis, ophthalmoplegia
Lhermitte sign or barber chair syndrome due to increased mechano sensitivity

Truncal and gait ataxia: also seen in mets causing cord compression impaired conduction in dorsal spino cerebellar tract may be a primary manifestation of epidural spinal cord compression- lower extremity dysmetria and gait ataxia, pt usually have thoracic spine compression due to selective vulnerability of spinocerebellar tract in thoracic spine to compressive ischemia
Anterior horn cell syndrome

- Aterior horn cell, cranial motor nuclei involved
- Autosomal recessive spinomuscular atrophy
- Diffuse weakness and atrophy, fasciculations of trunk and extremities
- Muscle tone & DTR ↓
- Sensation intact
Combined anterior horn cell and pyramidal tract disease

- Progressive diffuse LMN signs with UMN dysfunction
- Striated muscles except pelvic floor muscles affected
- U/L, muscles of hands and foot are involved
- Sparing rectal and urethra sphincter
- Bulbar and pseudobulbar inv super imposed
Anterior spinal artery syndrome:
Territory – anterior funiculi, anterior horn, base of the dorsal horn, periependymal area, antero medial aspect of lateral funiculi
Lower thoracic segment and conus- vulnerable
Abrupt onset of radicular pain, girdle pain
Flaccid quadriplegia, paraplegia
Bowel bladder dysfunction
Thermo anaesthesia analgesia
Position vibration light touch preserved
Painful burning dysasthesia
Watershed boundary zone T1-T4, L1, central white matter of anterior funiculi
Venous spinal cord infarction:
Impaired venous drainage, insitu thrombosis
Retrograde emboli
Chronic venous hypertension- irreversible spinal injury
Slowly progressive myelopathy, varying degrees of pain and sensory disturbances in the extremities, bladder bowel disturbances
- Posterior spinal artery syndrome:
  Uncommon
  Loss of position, proprioception, vibration
  Loss of segmental reflexes
  Pain, temperature – preserved
  Motor function – preserved
  Rarely – U/L posterior horn, lateral spinal cord inv
- Lacunar infarct:
  Isolated focal motor/sensory deficits in extremities
- Hypoxic myelopathy:
  Slowly progressive paraparesis/quadripareisis
- Hemoynaemic TIA:
  Spinal cord claudication
Localisation of spinal cord lesion at different levels

- Foramen magnum syndrome & lesions of upper cervical cord:
  - Sub occipital pain in C2 distribution, neck stiffness, electric shock like sensation
  - Sub occipital paraesthesia, syringo myelic type of sensory dissociation, finger tip numbness and tingling
  - Spastic tetraparesis, long tract sensory findings, lower cranial nerve palsy
  - “around the clock presentation of UMN type of weakness
  - Foramen magnum lesion- down beat nystagmus, papilloedema, cerebelar ataxia
  - Causes: tumour, ex spondylosis, basilar invagination in pagets disease, syrinx, C1C2 subluxation, chiari, MS
Pyramidal tract decussates at cervicomedullary junction; lesion at this place causes HEMIPLEGIA CRUCIATA, onion skin pattern of facial sensory loss, respiratory insufficiency, bladder dysfunction.

Compressive lesion of C1-C5 cord segment may compromise the cranial nerve 11.

C3-C5 lesion produces diaphragmatic paralysis.

High cervical cord lesion—respiratory arrest.
Lesions of C5-C6:

LMN signs at corresponding segment level. UMN sign below the lesion, LMN paresis of arm associated with spastic para paresis of lower extremities.

C5 level:
Diaphragmatic function compromised
BJ&BRJ –ve
TJ & FFR ++++
Inversion of brachio radialis reflex
Sensory loss entire body below neck and anterior shoulder

C6 level:
BJ, BRJ, TJ –ve & FFR ++++
Sensory loss same as that of C5 lesion sparing the lateral part of arm
Lesion at C7:
Diaphragm fn normal
Paresis of flexors and extensors of wrist and fingers
BJ,BRJ-Normal, FFR++++
Paradoxical triceps jerk
Sensory loss at /below 3rd 4th finger

Lesion at C8 T1:
Weakness of small muscles of hands with spastic paraparesis
C8 inv- TJ &FFR-ve
T1 inv-TJ –Normal, FFR-ve
U/L or B/l horner syndrome
Sensory loss starts from fifth digit
Lesion of thoracic segment level:
Root pain, paraesthesia mimicking intercostal neuralgia
Segmental LMN paralysis
Paraplegia and sensory loss below a thoracic level
Bladder, bowel sexual dysfunction
Lesion above T5- orthostatic hypotension, episodic autonomic dysreflexia
Lesion at T10- +ve Beevors sign
Lesion at T6- abdominal reflex –ve
Lesion at T10 – upper, middle part +ve
Lesion at T12- abdominal reflex intact
Lesion at L1:
All muscles of lower extremities – weak
Lower abd musc- Internal oblique, tr abd weak
Sensory loss – both lower limbs up to groin, to a level above buttocks
Chronic lesion- patellar++++, ankle++++

Lesion at L2:
Spastic paraparesis
Cremasteric reflex↓↓, patellar reflex ↓↓
Ankle jerk ++++
Sensation in upper anterior aspect preserved
Lesion at L3:
Some preservation of hip flexion, adduction
KJ ↓↓, ankle++++
Sensation upper anterior aspect of thigh normal

Lesion at L4:
Better hip flexion, adduction
Able to stand stabilising knee
KJ↓↓, ankle++++
Sensation normal in anterior aspect of thigh, superomedial aspect of knee

Lesion at L5:
Normal hip flexion, adduction
KJ- normal, ankle++++ pt extends knee against resistance
Sensation normal in antr aspect of thigh, medial aspect of legs ankle and sole
Lesion at S1:
Weakness of triceps surae, flexors of foot, and small muscles of foot
Ankle reflex↓↓, KJ-normal
Sensory loss- sole, heel, outer aspect of foot and ankle, medial aspect of calf,
posterior thigh, outer aspect of saddle area also anaesthetic

S2 lesion:
Triceps surae spared, flexors of toes, small muscles of foot weakness
Ankle jerk ↓↓
Sensory loss- upper part of dorsal aspect of calf, dorsolateral aspect of thigh
and saddle area
Conus medullaris lesion

Pelvic floor weakness, early sphincter dysfunction
Autonomous neurogenic bladder
Constipation, impaired ejaculation and erection
Symmetric saddle anaesthesia
Pain
Tethered spinal cord:
  numbness feet
  asymmetric muscle atrophy of calf and thigh, UMN signs,
  bowel bladder dysfunction, foot deformities, cutaneous
  manifestations of spinal dysraphism
Cauda equina lesion

- Compression lumbar sacral roots below L3 vertebra
- U/L early radicular pain, worse at night
- Flaccid hypotonic areflexic paralysis producing peripheral paraplegia
- Asymmetrical sensory loss in saddle area
- KJ variable, ankle ↓↓
- Sphincter dysfunction similar to conus lesion but late
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<tr>
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<td>-ve, B/L</td>
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