CNS Demyelination (GENERAL)

Common features of CNS demyelination disorders

1. Demyelinating (s. myelinoclastic) diseases - destruction of normal myelin - many acquired neurologic disorders.
2. Demyelinating - inadequate myelin formation or maintenance - many congenital metabolic disorders.

N.B. CNS myelin (formed by oligodendroglia) differs chemically and immunologically from PNS myelin (formed by Schwann cells), but both types have same function - to promote transmission of neural impulse along axon.

Idiopathic (presumably autoimmune)

Recurrent / chronically progressive demyelination – most common CNS demyelination disorders:
1. Multiple sclerosis
2. Multiple sclerosis variants: 1) neumyelitis optica (s. Devic disease) 2) concentric sclerosis (s. Buli disease, encephalitis periaxialis concentrica) 3) Marburg variant of MS - clinically fulminant MS form 4) Schilder disease (s. encephalitis periaxialis diffusa, diffuse sclerosis)

Monophasic demyelination (may be first clinical episode of multiple sclerosis!):
1. Optic neuritis
2. Acute transverse myelitis

CNS complications of viral infections / vaccinations:
1. Acute disseminated encephalomyelitis (ADEM)
2. Acute necrotizing hemorrhagic encephalomyelitis (ANHEM)

Leukodystrophies - inherited disorders that affect myelin synthesis / turnover:

Primarily affecting CNS myelin:
1. Adrenoleukodystrophy
2. Pelizaeus-Merzbacher disease
3. Spongy degeneration (s. Canavan's disease)
4. Alexander's disease

CNS-PNS myelin:
1. Metachromatic leukodystrophy
2. Globoid cell leukodystrophy (s. Krabbe's disease)
3. Cockayne’s syndrome

Viral infections
1. Progressive multifocal leukoencephalopathy (JC virus infection of oligodendrocytes)
2. Subacute sclerosing panencephalitis (measles virus infection of neurons and glia)

Nutritional disorders:
1. Combined syndensin disease (s. vit. B2 deficiency)
2. Demyelination of corpus callosum (s. Marchiafava-Bignami disease)
3. Central pontine myelolysis

Autoimmune demyelination:
1. Delayed postanoxic cerebral demyelination
2. Progressive subcortical ischemic encephalopathy

Common features of CNS demyelination disorders

1. Affect young adults
2. Inflammation & selective destruction of CNS myelin (with relative preservation of axons and PNS)
3. Clinical deficits are due to: a) effect of myelin loss on transmission of electrical impulses. b) limited capacity of CNS to regenerate normal myelin. c) secondary damage to axons.
4. No specific tests; diagnosis is based on distinctive clinical patterns of CNS injury.

Demyelination may have either negative or positive effects.

Negative conduction abnormalities - ALLOWED AXONAL CONDUCTION, variable CONDUCTION BLOCK (in response to raised temperature or with metabolic changes in extracellular milieu) → fluctuations in function that vary from day to day, worsenings with body temperature elevation.

Positive conduction abnormalities - ICTOPIC IMPULSE GENERATION (spontaneously or following mechanical stress), ABNORMAL “CROSSTALK” between demyelinated axons → Lhermitte’s symptom, paroxysmal symptoms,paresthesia.

Incidental white-matter hyperintensities

1. In deep parietal white matter.
2. Seen in up to 24% of men.
3. No clinical significance - no associations with neurological abnormalities, CD4 count, alcohol or drug use, hypertension or smoking.

Diagnostic algorithm of pediatric onset demyelinating disorders

Abbreviations: ADEM = acute disseminating encephalomyelitis; CIS = clinically isolated syndrome; CBIND = chronic relapsing inflammatory optic neuropathy; NMO = neuromyelitis optica; RRMS = relapsing-remitting MS.