

Medicine for Managers

Dr Paul Lambden BSc MB BS BDS FDSRCS MRCS LRCP DRCOG MHSM

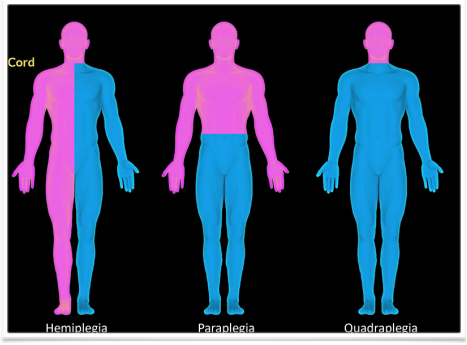
Medicine of the Nervous System

In the last two weeks we have reviewed the Brain and Spinal Cord, together with the Peripheral Nervous System which supplies it with information and through which messages are sent to the body. This whole amazing and immensely complex neurochemical system, together with the organs of special sense, the eyes, ears and organs of smell and taste, allow the body to operate autonomously to a high level.

The system is vulnerable to a huge number of different diseases and disorders, many of which target specific areas of the central or peripheral nervous system whilst others interfere with or destroy individual components of the system resulting in a diverse range of neurological diseases.

They may be classified as:

- ***Trauma***. Injuries to parts of the nervous system will cause symptoms related to the deficit arising from the nervous damage. Damage to the brain may cause all grades of injury up to and including the development of a vegetative state or death. Injuries to the spinal cord may result in a range of sensory disorders depending on the area involved and which peripheral nerves are disabled or destroyed. Other injuries may destroy motor nerves resulting in weakness or paralysis which may be localised or which may lead to hemiparesis (weakness) or hemiplegia (paralysis) of one side of the body. Alternatively, the cord damage may result in paraparesis (weakness) or paraplegia (paralysis) of the lower limbs, or, if the spinal damage is at neck level, tetraparesis or tetraplegia (weakness or paralysis of all four limbs).



- ***Structural Disorders***. Apart from traumatic events outlined above, the nervous system may be vulnerable to a variety of diverse threats including:
    - Spondylosis (arthritic changes) leading to compression of nerves and pain or weakness)

Medicine for Managers articles are not intended to be a source of medical advice. Their purpose is to familiarise the non-medical reader about current key medical disorders. Any medical or medicinal products mentioned by name are examples only and should not be regarded as an endorsement of their use.

    - Viral infections such as Bell's palsy or Guillain-Barré syndrome
    - Brain and spinal cord tumours

- ***Infections*** such as encephalitis, meningitis, polio or brain or spinal cord abscesses
- ***Vascular Disorders*** such as stroke, transient ischaemic attack, subdural haemorrhage, subarachnoid haem-orrhage and extradural haemorrhage
- ***Degenerative Diseases*** such as Parkinson's disease, muscular dystrophy, Huntingdon's chorea and Alzheimer's disease.
- ***Auto-immune disorders*** such as multiple sclerosis and myaesthesia gravis.

There are of course a host of other neurological diseases as well and many fall into more than one category. In addition there are functional disorders such as headache, dizziness, neuralgia and epilepsy.

These disorders may result in a wide variety of symptoms, many of which are serious and would require immediate medical attention.

- ➢ ***Headache***, particularly if sudden onset, very severe, changing or different from previous headaches
- ➢ ***Loss of vision*** or ***double vision***
- ➢ ***Loss of sensation*** or ***disturbed sensation*** such as tingling (paraesthesia)
- ➢ ***Muscle changes*** such as weakness, rigidity, wasting or loss of strength
- ➢ ***Trembling*** or ***shaking***
- ➢ ***Loss of co-ordination*** or ***impaired mental ability***
- ➢ ***Seizures***
- ➢ ***Pain in the neck or spine***, particularly if radiating to the arms, legs, feet or to any other part of the body.

Brain Damage is a blanket term, encompassing a range of disorders. These include:

Traumatic Brain Injury which follows some sort of external force, such as a blow to the head or a bullet wound to the head.

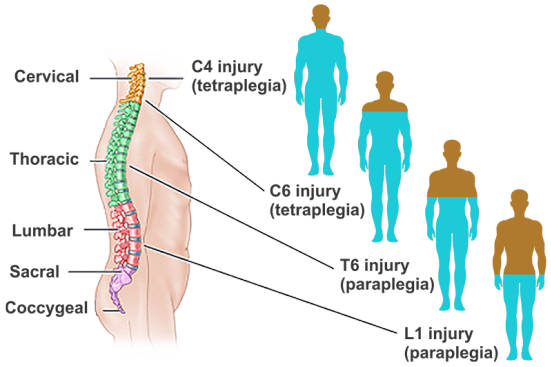
The latter may cause only localised damage. Closed injuries, however, may cause diffuse brain injury as the vibration from the blow spreads like a wave through the brain which has the consistency of a jelly. In mild cases, the ***concussion*** may reveal itself as headache, confusion, memory problems and nausea.

In more moderate cases, the blow will cause more severe but similar symptoms. Even with mild brain injury, 15% of patients will still have persistent symptoms a year later. With severe brain injury, with or without skull fracture, the result will be death of up to billions of nerve cells and damage to billions more.

The person will suffer life-changing and debilitating problems with behavioural, cognitive and consequent physical difficulties. Some will end up in a coma and others will remain dependent on care for the rest of their lives.
Spinal Cord Damage can result in the weakness or paralysis described above.

Medicine for Managers articles are not intended to be a source of medical advice. Their purpose is to familiarise the non-medical reader about current key medical disorders. Any medical or medicinal products mentioned by name are examples only and should not be regarded as an endorsement of their use.

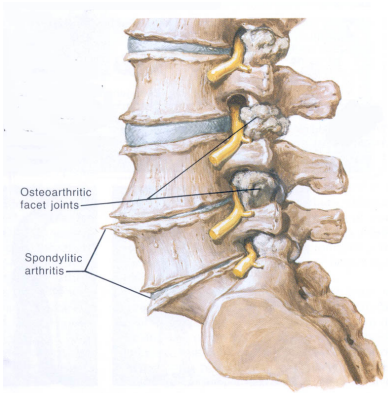
The symptoms and signs of either muscle weakness or paralysis, or sensory loss, indicate the level of the spinal cord where the damage is present. Therefore, for example, damage to the spinal cord low down will affect only the lower limbs whereas damage at the level of the neck will affect the whole body and all four limbs



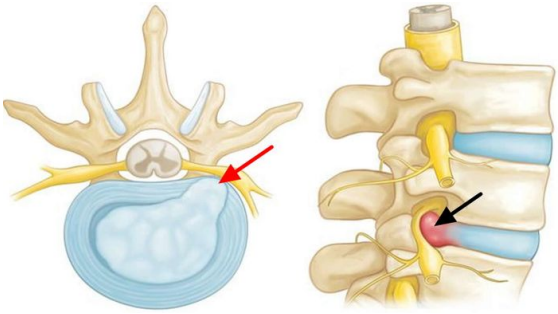
The diagram above gives illustrative examples of the loss of function (shown in blue) depending on the spinal level of the damage through injury or disease.

Other types of disorder:

Arthritic change. As we age, vertebral and disc wear and tear can result in symptoms most commonly felt in the periphery. Common sites are sciatica felt down the leg and neck arthritis felt in the arm. ***Sciatica*** is a pain radiating from the back down the leg. Onset may be sudden, usually the result



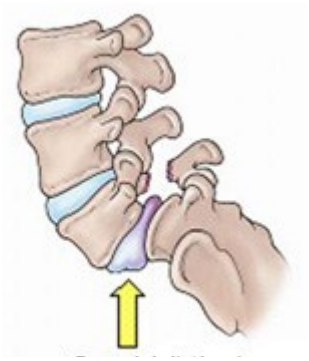
of trauma with activities such as heavy lifting, or more gradually with disorders such as arthritic change. In most cases the cause is disc herniation following collapse of the disc and the development of osteophytes (shown projecting from the vertebrae in the diagram above) can also irritate the nerves as they enamate from the spaces between the vertebrae.



The diagram shows a disc prolapsing (marked with a red arrow and due to the softer inner material squeezing through the outer fibrous ring of the disc) and pressing on the nerve. This results in the symptoms which extend to any point on the course of the nerve to the big toe. Sciatica is classically felt on one side only.

Spondylolisthesis (pronounced spon-dill-oh-liss-thee-sis) is a condition where one vertebra slips on another. It can be due to arthritic wear, trauma or other abnormality such as a tumour

Medicine for Managers articles are not intended to be a source of medical advice. Their purpose is to familiarise the non-medical reader about current key medical disorders. Any medical or medicinal products mentioned by name are examples only and should not be regarded as an endorsement of their use.



It most commonly affects the lower back It may cause pain and sciatica. At its most serious at higher levels, it may compress the spinal cord causing weakness or even paralysis.

Infections may affect the nervous system, including encephalitis and meningitis.

Encephalitis is a disease which normally starts with flu-like symptoms, including headache, temperature and lethargy. More serious symptoms may develop, including confusion, fits, behavioural changes, difficulty with speech, weakness or muscular spasm and loss of consciousness. Most commonly caused by a virus (including the herpesvirus and the chicken pox virus) and less commonly by a bacterial or fungal infection.

The disease is managed by hospitalisation and the use of anti-infective agents together with supportive care.

Most people recover but some are left with varying degrees of brain damage

Meningitis is an infection of the membranes that surround the brain. It may be serious and even fatal if not diagnosed and treated quickly.

Symptoms include severe headache, high temperature, vomiting and neck stiffness, classically with dislike of light, drowsiness and fits. A fixed purple rash may develop which does not fade if a glass is pressed on it.

It is caused by bacterial or viral infection. Bacterial infection is rarer but more serious than viral meningitis.

It is spread through sneezing, coughing and kissing amongst other things.

Hospitalisation is commonly necessary. Bacterial meningitis is treated with intravenous antibiotics and viral meningitis with supportive therapies.

Most people will recover but others are left with long-term damage and it is fatal in some cases.

Poliomyelitis used to be a common viral illness, essentially eradicated in the UK by vaccination but still present in some parts of the world.

The infection causes headache, vomiting, abdominal pain and aching muscles. In a small number of cases, the virus attacks nerves in the spine and base of the brain which can cause paralysis which develops over hours and which is usually reversible over a period of weeks or months.

There is no cure for polio.

Degenerative diseases may affect the nervous system.

Motor Neurone Disease (or ***Amyotrophic Lateral Sclerosis (ALS)*** is rare and progressively damages the nervous system.

It leads to muscle weakness and wasting, leading to progressive limitation of walking, grasping, speaking and also swallowing and breathing, all of which may ultimately become impossible.

Medicine for Managers articles are not intended to be a source of medical advice. Their purpose is to familiarise the non-medical reader about current key medical disorders. Any medical or medicinal products mentioned by name are examples only and should not be regarded as an endorsement of their use.

Specialist nerve cells in the brain and spinal cord called ***motor neurones*** stop working properly.

The motor neurones carry instructions to muscles throughout the body to make muscles contract. If the nerves are interrupted, the muscles lose their tone and become floppy.

It is not clear what actually actually causes the neurones to stop working properly.

Parkinson's Disease is a progressive condition associated with the development of symptoms of slow movement (bradycardia), involuntary shaking (tremor) and stiffness of muscles.

Symptoms include difficulties with balance, insomnia, forgetfulness and depression. About 1 in 500 people is affected.

The disease is caused by the degeneration of nerve cells in a part of the brain called the substantia nigra, resulting in diminished levels of a chemical called dopamine in the brain.

The cause of the nerve cell destruction is not known but is suspected to be associated with genetic and possibly with environmental factors.

There is no cure for Parkinson's disease but there is treatment to counteract the symptoms

So-called ***auto-immune*** diseases also can attack the nervous system.

Guillain-Barré Syndrome (pronounced gay-yan-bar-ray) is rare and serious. It produces pins and needles and numbness, muscle weakness and pain, disturbed balance and loss of co-ordination.

It may prevent walking and moving and in severe cases breathing is compromised. Guillain-Barré is believed to be one of the diseases which is described as auto-immune.

This means that the immune system, which produces antibodies to destroy infections, somehow mistakes normal healthy body tissues as 'foreign' and attacks and damages them in error.

The mistake in the defence mechanism may be caused infection, vaccination, or sometimes following surgery.

The disease can be treated by the use of intravenous immunoglobulin, proteins to neutralise the damage being caused by the immune system and made from donated blood.

Myaesthenia gravis is another disease in which the auto-immune response is implicated.

It leads to progressive muscle weakness with progressively droopy eyelids, loss of facial expression and difficulty with chewing or swallowing.

It is believed that myaesthenia is an auto-immune disease in which the antibody reaction leads to damage at the point where the motor nerve sending instructions to the affected muscles actually join the muscles themselves.

The mechanism is not fully understood but there seems to be an association with enlargement or a growth in the thymus gland (a gland in the neck which produces cells for the immune system and which normally shrinks after puberty).

There is treatment which keeps the symptoms controlled over a long period.

Medicine for Managers articles are not intended to be a source of medical advice. Their purpose is to familiarise the non-medical reader about current key medical disorders. Any medical or medicinal products mentioned by name are examples only and should not be regarded as an endorsement of their use.

It is hardly surprising that there are thousands of neurological diseases because of the complexity and the enormity of the numbers of cells in the system.

The few detailed above do not scratch the surface of the types that exist but they do illustrate the different parts of the nervous system affected by different illnesses.

A brain with 90 billion nerve cells alone, in a system with a hundred trillion nerve connections and with impulses carried at a speed of up to 200 miles an hour or more, is unimaginable.



If all the nerve cells were laid end-to-end they would be nearly 1,000 km long.

There are more cells in the human brain than stars in the milky way.

Your body is truly amazing!

paullambden@compuserve.com

Medicine for Managers articles are not intended to be a source of medical advice. Their purpose is to familiarise the non-medical reader about current key medical disorders. Any medical or medicinal products mentioned by name are examples only and should not be regarded as an endorsement of their use.