

Chapter 1 : - Clinical Examinations in Neurology by Mayo Clinic Department of Neurology

The Sections of Neurology and Physiology of the Mayo Clinic have combined their extensive clinical experience in this very practical book. It is mainly concerned with the history-taking and neurological examination but it has excellent chapters on electroencephalography, electromyography, cerebrospinal fluid, and biochemical and pharmacological aids to diagnosis.

Testing of motor and sensory function requires a basic understanding of normal anatomy and physiology. Voluntary movement begins with an impulse generated by cell bodies located in the brain. Signals travel from these cells down their respective axons, forming the Corticospinal tract. At the level of the brain stem, this motor pathway crosses over to the opposite side of the body and continues downward on that side of the spinal cord. A discussion of these tracts can be found in other Neurology reference texts. For more information about motor pathways, see the following link: [The precise location of the synapse depends upon where the lower motor neuron is destined to travel.](#) If, for example, the LMN terminates in the hand, the synapse occurs in the cervical spine. The axons of the PNS travel to and from the periphery, connecting the organs of action. Nerves which carry impulses away from the CNS are referred to as Efferents. Axons that exit and enter the spine at any given level generally connect to the same distal anatomic area. These bundles of axons, referred to as spinal nerve roots, contain both afferent and efferent nerves. For more information about spinal cord anatomy, see the following link: [Review of Spinal Anatomy](#) As the efferent neurons travel peripherally, components from different roots commingle and branch, following a highly programmed pattern. Ultimately, contributions from several roots may combine to form a named peripheral nerve, which then follows a precise anatomic route on its way to innervating a specific muscle. The Radial Nerve, for example, travels around the Humerus bone of the upper arm, contains contributions from Cervical Nerve Roots 6, 7 and 8 and innervates muscles that extend the wrist and supinate the forearm. It may help to think of a nerve root as an electrical cable composed of many different colored wires, each wire representing an axon. As the cable moves away from the spinal cord, wires split off and head to different destinations. Prior to reaching their targets, they combine with wires originating from other cables. The group of wires that ultimately ends at a target muscle group may therefore have contributions from several different roots. For more information about radial nerve anatomy and function, see below. Afferents carry impulses in the opposite direction of the motor nerves. That is, they bring information from the periphery to the spinal cord and brain. Sensory nerves begin in the periphery, receiving input from specialized receptor organs. The axons then move proximally, joining in a precise fashion with other axons to form the afferent component of a named peripheral nerve. The Radial Nerve, for example, not only has a motor function described previously but also carries sensory information from discrete parts of the hand and forearm. As the sensory neurons approach the spinal cord, they join specific spinal nerve roots. Each root carries sensory information from a discrete area of the body. The area of skin innervated by a particular nerve root is referred to as a dermatome. Dermatome maps describe the precise areas of the body innervated by each nerve root. These distributions are more or less the same for all people, which is clinically important. In the setting of nerve root dysfunction, the specific area supplied by that root will be affected. This can be mapped out during a careful exam, identifying which root is dysfunctional. To view a dermatomal map, see the following link: [Dermatome Map](#) University of Scranton Sensory input travels up through the spinal cord along specific paths, with the precise route defined by the type of sensation being transmitted. Nerves carrying pain impulses, for example, cross to the opposite side of the spinal cord soon after entering, and travel up to the brain on that side of the cord. Vibratory sensations, on the other hand, enter the cord and travel up the same side, crossing over only when they reach the brain stem see following sections for detailed descriptions. For more information about sensory pathways, see the following link: [University of Washington Review of Sensory Pathways](#) Ultimately, the sensory nerves terminate in the brain, where the impulses are integrated and perception occurs. Understanding the above neuro-anatomic relationships and patterns of innervation has important clinical implications when trying to determine the precise site of neurological dysfunction. Injury at the spinal nerve root level, for example, will

produce a characteristic loss of sensory and motor function. This will differ from that caused by a problem at the level of the peripheral nerve. An approach to localizing lesions on the basis of motor and sensory findings is described in the sections which follow. Realize that there is a fair amount of inter-individual variation with regards to the specifics of innervation. Also, recognize that often only parts of nerves may become dysfunctional, leading to partial motor or sensory deficits. As such, the patterns of loss are rarely as "pure" as might be suggested by the precise descriptions of nerves and their innervations.

Sensory Testing

Sensory testing of the face is discussed in the section on Cranial Nerves. Testing of the extremities focuses on the two main afferent pathways: Spinothalamic and Dorsal Columns. These nerves detect pain, temperature and crude touch. They travel from the periphery, enter the spinal cord and then cross to the other side of the cord within one or two vertebral levels of their entry point. They then continue up that side to the brain, terminating in the cerebral hemisphere on the opposite side of the body from where they began. These nerves detect position. They travel from the periphery, entering the spinal cord and then moving up to the base of the brain on the same side of the cord as where they started. Upon reaching the brain stem they cross to the opposite side, terminating in the cerebral hemisphere on the opposite side of the body from where they began. A screening evaluation of these pathways can be performed as follows: To do this, break a Q-tip or tongue depressor in half, such that you create a sharp, pointy end. Alternatively, you can use a disposable needle or the sharp and blunt ends of a safety pin. I would discourage the use of the pointy, metal spikes that accompany some reflex hammers. Better to use a disposable implement. Ask the patient to close their eyes so that they are not able to get visual clues. Start at the top of the foot. Orient the patient by informing them that you are going to first touch them with the sharp implement. Then do the same with a non-sharp object. This clarifies for the patient what you are defining as sharp and dull. Now, touch the lateral aspect of the foot with either the sharp or dull tool, asking them to report their response. If they give accurate responses, do the same on the other foot. The same test can be repeated for the upper extremities. As such, it contributes to balance. Similar to the Spinothalamic tracts, disorders which affect this system tend to first occur at the most distal aspects of the body. Thus, proprioception is checked first in the feet and then, if abnormal, more proximally. Ask the patient to close their eyes so that they do not receive any visual cues. With one hand, grasp either side of great toe at the interphalangeal (IP) joint. Place your other hand on the lateral and medial aspects of the great toe distal to the IP. Orient patient to up and down as follows:

Testing Proprioception

Alternately deflect the toe up or down without telling the patient in which direction you are moving it. They should be able to correctly identify the movement and direction. Both great toes should be checked in the same fashion. If normal, no further testing need be done in the screening exam. Similar testing can be done on the fingers.

Vibratory sensation travels to the brain via the dorsal columns. Thus, the findings generated from testing this system should corroborate those of proprioception see above. Start at the toes with the patient seated. You will need a 128 Hz tuning fork. Grasp the tuning fork by the stem and strike the forked ends against the floor, causing it to vibrate. Place the stem on top of the interphalangeal joint of the great toe. Put a few fingers of your other hand on the bottom-side of this joint. **Testing vibratory sensation** Ask the patient if they can feel the vibration. You should be able to feel the same sensation with your fingers on the bottom side of the joint. The patient should be able to determine when the vibration stops, which will correlate with when you are no longer able to feel it transmitted through the joint. It sometimes takes a while before the fork stops vibrating. If you want to move things along, rub the index finger of the hand holding the fork along the tines, rapidly dampening the vibration. Repeat testing on the other foot. Patients should normally be able to distinguish simultaneous touch with 2 objects which are separated by at least 5mm. These stimuli are carried via the Dorsal Columns. While not checked routinely, it is useful test if a discrete peripheral neuropathy is suspected. Testing can be done with a paperclip, opened such that the ends are 5mm apart. The patient should be able to correctly identify whether you are touching them with one or both ends simultaneously, along the entire distribution of the specific nerve which is being assessed.

Special Testing for Early Diabetic Neuropathy: A careful foot examination should be performed on all patients with symptoms suggestive of sensory neuropathy or at particular risk for this disorder.

Chapter 2 : Neurology - Department home - Mayo Clinic

Fulfillment by Amazon (FBA) is a service we offer sellers that lets them store their products in Amazon's fulfillment centers, and we directly pack, ship, and provide customer service for these products.

Other common tests History You should be prepared to discuss your symptoms in detail with your doctor. Your doctor will ask you to describe your symptoms, when you experience them, how long the episodes last and the amount of discomfort or pain you experience. The more specific you can be about the tingling, numbness, weakness or other symptoms you are experiencing, the easier it will be for your doctor to understand your condition. Your doctor may also ask you general health questions that may seem unrelated to your symptoms, but are, in fact, important. These questions could be about whether or not you feel faint, nauseated or tired. The doctor may also ask if your bladder control and sexual function are normal. You will also be asked if you are suffering from any other illnesses and if you are taking medications. The physician will then perform a physical exam to test for loss of vibratory sensation. He or she will test ankle jerks and other reflexes. Sensations in the feet and hands will be evaluated with a pin. Since some neuropathies are hereditary, your doctor will ask if other members of your family have suffered from any type of neuropathy or neurological disorder. Neurological evaluation A neurological evaluation consists of a physical exam and a number of simple and painless tests. The purpose of these tests is to assess your neurological function, including your muscle strength, how your autonomic nerves are functioning, and your ability to feel different sensations. Frequently the neurologist will recommend electrodiagnostic testing to measure the electrical activity of muscles and nerves. If necessary, the neurologist may also recommend a nerve biopsy, a spinal tap or magnetic resonance imaging MRI. However, for some patients with longstanding neuropathy, the cause may not be found in spite of extensive tests and examinations. Electrodiagnostic tests Electrodiagnostic tests measure the electrical activity of muscles and nerves. By measuring the electrical activity they are able to determine if there is nerve damage, the extent of the damage and potentially the cause of the damage. Frequently the neurologist will recommend common, noninvasive neurological evaluations such as electromyography EMG and nerve conduction velocity NCV testing. Blood tests Blood tests are commonly employed to check for vitamin deficiencies, toxic elements and evidence of an abnormal immune response. Depending on your individual situation, your doctor may request certain laboratory tests to identify potentially treatable causes for neuropathy. These include tests for: Vitamin B12 and folate levels Thyroid, liver and kidney functions Vasculitis evaluation Antibodies to nerve components e. Your doctor may recommend quantitative sensory testing QST, autonomic testing, a nerve biopsy, a lumbar puncture, an imaging study, or other tests to diagnose a specific disorder.

The sixth edition of this popular manual, first published in by the members of the neurology department at the Mayo Clinic, Rochester, Minn, retains the essential character of the previous editions.

Republic of Ireland [3] [4] Fields of employment Hospitals, Clinics Polish neurologist Edward Flatau greatly influenced the developing field of neurology. He published a human brain atlas in and wrote a fundamental book on migraines in Jean-Martin Charcot is considered one of the fathers of neurology. In the United States and Canada, neurologists are physicians having completed postgraduate training in neurology after graduation from medical school. Neurologists complete, on average, about 8 years of medical college education and clinical training, which includes obtaining a four-year undergraduate degree, a medical degree DO or MD , which comprises an additional four years of study, then completing one year of basic clinical training and four years of residency. Some neurologists receive additional subspecialty training focusing on a particular area of the field. These training programs are called fellowships , and are one to two years in duration. Subspecialties include brain injury medicine, clinical neurophysiology , epilepsy , hospice and palliative medicine , neurodevelopmental disabilities, neuromuscular medicine , pain medicine , sleep medicine , neurocritical care, vascular neurology stroke , [7] behavioral neurology , child neurology, headache, multiple sclerosis, neuroimaging, neurorehabilitation. In Germany, a compulsory year of psychiatry must be done to complete a residency of neurology. In the United Kingdom and Ireland, neurology is a subspecialty of general internal medicine. After five to nine years of medical school and a year as a preregistration house officer or two years on the Foundation Programme , a neurologist must pass the examination for Membership of the Royal College of Physicians or the Irish equivalent before completing two years of core medical training and then entering specialist training in neurology. A generation ago, some neurologists would have also spent a couple of years working in psychiatric units and obtain a diploma in psychological medicine. However, this requirement has become uncommon, and, now that a basic psychiatric qualification takes three years to obtain, the requirement is no longer practical. A period of research is essential, and obtaining a higher degree aids career progression. Some neurologists enter the field of rehabilitation medicine known as physiatry in the US to specialise in neurological rehabilitation, which may include stroke medicine, as well as brain injuries. The patient then takes a neurological exam. Typically, the exam tests mental status, function of the cranial nerves including vision , strength, coordination, reflexes, and sensation. This information helps the neurologist determine whether the problem exists in the nervous system and the clinical localization. Localization of the pathology is the key process by which neurologists develop their differential diagnosis. Further tests may be needed to confirm a diagnosis and ultimately guide therapy and appropriate management. This section needs additional citations for verification. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed. February Learn how and when to remove this template message Neurologists examine patients who are referred to them by other physicians in both the inpatient and outpatient settings. Neurologists begin their interactions with patients by taking a comprehensive medical history , and then performing a physical examination focusing on evaluating the nervous system. In some instances, neurologists may order additional diagnostic tests as part of the evaluation. Commonly employed tests in neurology include imaging studies such as computed axial tomography CAT scans, magnetic resonance imaging MRI , and ultrasound of major blood vessels of the head and neck. Neurophysiologic studies, including electroencephalography EEG , needle electromyography EMG , nerve conduction studies NCSs and evoked potentials are also commonly ordered. Advances in genetic testing have made genetic testing an important tool in the classification of inherited neuromuscular disease and diagnosis of many other neurogenetic diseases. The role of genetic influences on the development of acquired neurologic diseases is an active area of research. Neurologists are also asked to evaluate unresponsive patients on life support to confirm brain death. Treatment options vary depending on the neurological problem. They can include referring the patient to a physiotherapist , prescribing medications, or recommending a surgical procedure. Some neurologists specialize in certain parts of the nervous system or in specific procedures. For example,

clinical neurophysiologists specialize in the use of EEG and intraoperative monitoring to diagnose certain neurological disorders. In the US, physicians do not typically specialize in all the aspects of clinical neurophysiology i. The American Board of Clinical Neurophysiology certifies US physicians in general clinical neurophysiology, epilepsy, and intraoperative monitoring. Also, many nonmedical doctors, those with doctoral degrees usually PhDs in subjects such as biology and chemistry, study and research the nervous system. Working in laboratories in universities, hospitals, and private companies, these neuroscientists perform clinical and laboratory experiments and tests to learn more about the nervous system and find cures or new treatments for diseases and disorders. A great deal of overlap occurs between neuroscience and neurology. Many neurologists work in academic training hospitals, where they conduct research as neuroscientists in addition to treating patients and teaching neurology to medical students. General caseload[edit] Neurologists are responsible for the diagnosis, treatment, and management of all the conditions mentioned above. When surgical or endovascular intervention is required, the neurologist may refer the patient to a neurosurgeon or an interventional neuroradiologist. In some countries, additional legal responsibilities of a neurologist may include making a finding of brain death when it is suspected that a patient has died. Neurologists frequently care for people with hereditary genetic diseases when the major manifestations are neurological, as is frequently the case. Lumbar punctures are frequently performed by neurologists. Some neurologists may develop an interest in particular subfields, such as stroke, dementia , movement disorders , neurointensive care , headaches, epilepsy , sleep disorders , chronic pain management, multiple sclerosis , or neuromuscular diseases. Overlapping areas[edit] Some overlap also occurs with other specialties, varying from country to country and even within a local geographic area. Acute head trauma is most often treated by neurosurgeons, whereas sequelae of head trauma may be treated by neurologists or specialists in rehabilitation medicine. Although stroke cases have been traditionally managed by internal medicine or hospitalists, the emergence of vascular neurology and interventional neuroradiology has created a demand for stroke specialists. The establishment of Joint Commission -certified stroke centers has increased the role of neurologists in stroke care in many primary, as well as tertiary, hospitals. Some cases of nervous system infectious diseases are treated by infectious disease specialists. Most cases of headache are diagnosed and treated primarily by general practitioners , at least the less severe cases. Likewise, most cases of sciatica are treated by general practitioners, though they may be referred to neurologists or surgeons neurosurgeons or orthopedic surgeons. Sleep disorders are also treated by pulmonologists and psychiatrists. Cerebral palsy is initially treated by pediatricians , but care may be transferred to an adult neurologist after the patient reaches a certain age. Physical medicine and rehabilitation physicians also in the US diagnosis and treat patients with neuromuscular diseases through the use of electrodiagnostic studies needle EMG and nerve-conduction studies and other diagnostic tools. Clinical neuropsychologists are often called upon to evaluate brain- behavior relationships for the purpose of assisting with differential diagnosis , planning rehabilitation strategies, documenting cognitive strengths and weaknesses, and measuring change over time e. Relationship to clinical neurophysiology[edit] In some countries, e. US and Germany, neurologists may subspecialize in clinical neurophysiology , the field responsible for EEG and intraoperative monitoring , or in electrodiagnostic medicine nerve conduction studies , EMG, and evoked potentials. In other countries, this is an autonomous specialty e. Overlap with psychiatry[edit] Further information: Psychoneuroimmunology and Neuropsychiatry Although mental illnesses are believed by many to be neurological disorders affecting the central nervous system, traditionally they are classified separately, and treated by psychiatrists. Martin, Dean of Harvard Medical School and a neurologist by training, wrote, "the separation of the two categories is arbitrary, often influenced by beliefs rather than proven scientific observations. And the fact that the brain and mind are one makes the separation artificial anyway". Hence, the sharp distinction between neurology and psychiatry is not always on a biological basis. The dominance of psychoanalytic theory in the first three-quarters of the 20th century has since then been largely replaced by a focus on pharmacology. Neurological enhancement[edit] The emerging field of neurological enhancement highlights the potential of therapies to improve such things as workplace efficacy, attention in school, and overall happiness in personal lives.

Chapter 4 : The Precise Neurological Exam

This bar-code number lets you verify that you're getting exactly the right version or edition of a book. The digit and digit formats both work.

Chapter 5 : Clinical examinations in neurology (edition) | Open Library

This volume is a presentation of the neurological examination and is written primarily for trainees in clinical neurology. It includes not only the technic of examination of the nervous system, but also the anatomy and physiology which form the background of the neurological examination. There has.

Chapter 6 : Mayo Clinic Examinations in Neurology - Google Books

Clinical examinations in neurology by Mayo Clinic., , Saunders edition, in English - 3d ed.

Chapter 7 : Clinical examinations in neurology | Open Library

certification examination in neurology Beginning in , the American Board of Psychiatry and Neurology, Inc. (ABPN) issued two - dimensional content specifications for the psychiatry, neurology and child neurology.

Chapter 8 : Clinical Examinations in Neurology | JAMA Neurology | JAMA Network

If the address matches an existing account you will receive an email with instructions to reset your password.

Chapter 9 : Evaluation and Tests - What is a Neurological Exam?

Note: Citations are based on reference standards. However, formatting rules can vary widely between applications and fields of interest or study. The specific requirements or preferences of your reviewing publisher, classroom teacher, institution or organization should be applied.