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Neurological Injuries

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Abstract

Diagnosis and therapy of neurological diseases requires knowledge, expertise, patience and attention. The basis for a good clinical assessment of neurological disorders is certainly a neurological examination, after which a decision is made on further diagnostic procedures or treatment. Most common illnesses and conditions include: headache, walking instability, dizziness, muscular weakness, Parkinson's disease, Alzheimer's disease, memory disorders, convulsive states with epilepsy, syncope, stroke, restless legs syndrome, etc.

Key words: *Injury; Conditions; Exam*

Introduction

Neurological injury, particularly concussive head injury, is unfortunately a not uncommon event at the workplace or on the road [1]. There is a large and increasing number of claims for compensation for injuries of this type and neurological reports are frequently required to assess quantum in such cases. Claims of medical negligence, where diagnostic, neurosurgical (or radiological) mistakes are alleged, are generally either highly specialised (e.g. alleged vaccine brain damage or alleged Myodil arachnoiditis) or relatively rare isolated incidents. Neurological injury separates into four main categories:

- Head injury
- Neck injury
- Peripheral nerve injury
- Psychological and psychiatric effects of organic brain injury

Conditions

Neurological conditions are many and varied in their presentation and course [2]. Some illnesses are degenerative over time, for example motor neurone disease; others are subject to relapse and remission (e.g., multiple sclerosis), while still others are amenable to either treatment (e.g., myasthenia gravis), or cure (e.g., meningitis). The onset may be insidious or catastrophic: the course may be unpredictable or relentlessly progressive. These factors make it extremely difficult to anticipate and plan for both the day-to-day management and thefuture.

As many of the conditions become apparent or occur in young adulthood,the impact of this sudden change in fortune and difficulty in planning for thefuture goes beyond the individual directly affected. It can have a significant impact on the individual's family. Therefore, planning appropriate packages of care requires an assessment not only of individual need but also of the needs of the

family. However, no situation remains static over time and the family, like the individual and indeed the disease process, is dynamic and evolving.

Neurological Exam

The neurological exam is a clinical assessment tool used to determine what specific parts of the CNS are affected by damage or disease [3]. It can be performed in a short time—sometimes as quickly as 5 minutes—to establish neurological function. In the emergency department, this rapid assessment can make the difference with respect to proper treatment and the extent of recovery that is possible.

The exam is a series of subtests separated into five major sections. The first of these is the mental status exam, which assesses the higher cognitive functions such as memory, orientation, and language. Then there is the cranial nerve exam, which tests the function of the 12 cranial nerves and, therefore, the central and peripheral structures associated with them. The cranial nerve exam tests the sensory and motor functions of each of the nerves, as applicable. Two major sections, the sensory exam and the motor exam, test the sensory and motor functions associated with spina lnerves. Finally, the coordination exam tests the ability to perform complex and coordinated movements. The gait exam, which is often considered a sixth major exam, specifically assesses the motor function of walking and can be considered part of the coordination exam because walking is a coordinated movement.

Localization of function is the concept that circumscribed locations are responsible for specific functions. The neurological exam highlights this relationship. Forexample, the cognitive functions that are assessed in the mental status exam are based on functions in the cerebrum, mostly in the cerebral cortex. Several of the subtests examine language function. Deficits in neurological function uncovered by these examinations usually point to damage to the left cerebral cortex. In the majority of individuals, language function is localized to the left hemisphere between the superior temporal lobe and the posterior frontal lobe, including the intervening connections through the inferior parietal lobe.

Therapeutic Attitude

The medical profession in its training as well as in everyday practice takes a fundamentally therapeutic attitude to its patients [1]. The aim is perceived to be the diagnosis and assessment of injury or illness; and its restitution to the maximum extent possible. However, in the medico-legal context the role of the medical expert is quite different. He is seeing the "patient" in order to evaluate the effect that injury has caused and to provide a prognosis which will allow the court to come to a decision about the magnitude of compensation. By the time most claims come to settlement therapeutic aspects are generally long past. The practical therapeutic approach of medicine therefore may lead to conflicts which should be perceived by the doctor.

In clinical practice "functional overlay" tends to be discounted when an assessment of a patient's disability is made. Functional overlay is often considered irrelevant to the therapeutic process or at least a sphere of clinical activity which is the domain of the psychotherapist or social worker. In medicolegal practice anything attributable to the effects of the injury is relevant and should form a part of the claim. Similarly there will be cases where the rate (or degree of recovery from) injury is less than expected: or the contrary where the patient overemphasises to an unrealistic degree the recovery they have made.

In the assessment of any patient complaining of neurological symptoms some general principles must be borne in mind. Neurological symptoms may be associated with objective abnormality demonstrable on examination. But the objective signs may be disproportionate, that is, they may be less than the symptoms would lead you to expect so that wilful or subconscious exaggeration is suspected. Or the signs may seem unrelated to the symptom, for example, a complaint of paralysis when the signs indicate sensory loss. Or finally the neurological symptoms may have no corresponding sign or abnormality on examination. A lack of objective support for the organic basis of a complaint is relatively common in neurology. It occurs, for example, in many pain syndromes, especially those where the pain is associated with damage to peripheral nerve, the spinal cord or central nervous system. Migraine, epilepsy, irritability and personality change are all common post-traumatic phenomena where there is usually no associated objective abnormality. Compensation gives a motive to perpetuate symptoms previously experienced or to claim symptoms that have either recovered or never been sufficiently severe to cause disability.

The doctor must be able to recognise patterns of symptomatology associated with organic disorder of the CNS and to be able to distinguish these from symptoms that are exaggerated or feigned. Where there are abnormalities demonstrable on examination the case may appear straightforward and convincing but there should

be an "appropriateness" between history, present symptoms and objective abnormality.

A medical report in a neurological case must, therefore, do much more than merely record the medical facts about the case. It must give the considered opinion of the doctor about the disability experienced by the patient and the effects of that disability in terms of personal independence, suffering, need for domestic care, general mobility, ability to work, social integration and interpersonal relationships (especially with spouse) and finally life expectancy. There must always be an assessment of prospective risk of complication and in neurological practice the prospective risk of late post-traumatic epilepsy is important.

There is often genuine doubt as to what extent symptoms, especially pain, are exaggerated by the plaintiff to support their claim. In this situation the ideal is for the doctor to give a firm opinion one way or the other, that is, that the symptom is or is not genuine. And to back his view with reasoned discussion of the facts and medical knowledge that lead to this view. But opinion should go further by including comment about the effects of continuing litigation on the persistence of symptoms and in particular the doctor's view as to the likelihood or otherwise of the symptoms recovering rapidly once the claim is settled.

Concussion

Concussion should be defined and not used loosely to describe the effects of head injury [1]. Concussion is loss of consciousness through a blow to the head and consciousness is defmed as continuous awareness of self and surroundings and the recording of continuous memory.

Concussion is associated with retrograde amnesia, that is, the absence of memory for the events preceding the blow and in this particular, concussion differs from most other forms of loss of consciousness, e.g. fainting or epilepsy.

In practical terms subjects who have been concussed have a gap in their memory starting moments (or longer) before the head injury and continuing for a variable period of time after the head injury. A post-traumatic amnesia of seconds suggests a minor injury such as might be sustained in the boxing ring and is unlikely to be associated with permanent brain damage. A post-traumatic amnesia with duration measurable in minutes (up to 1 hour) implies a moderate head injury and amnesia of hours is usually associated with severe head injury and the possibility of severe and persisting brain damage.

Head injury, when associated with concussion, will usually have evidence of scalp or face wounds. But these wounds do not correlate well with the severity of the injury. Rather they correlate with the object which caused the blow to the head. Thus a flat yielding surface (e.g. soft earth) may cause no scalp injury but nonetheless be concussive, whereas a stab wound from a sharp instrument may cause extensive facial or scalp injuries without concussion. And a missile (e.g. a bullet) may cause a penetrating brain injury without immediate loss of consciousness.

In all neurological reports where concussion has occurred, reference should be made to the prospective risk of late post-traumatic epilepsy. Epilepsy carries the risk of accidental physical injury in an attack. And there is a risk of the order of 1 in 1000 of sudden unexpected death from a seizure. The mental effects of epilepsy are of major importance with an increased risk of psychiatric illness particularly depression and thought disorder of the schizoid type. But perhaps the most Significant effects of the development of epilepsy after head injury are social. Employment is usually at risk whether or not the subject has to work at heights, with heavy machinery or open furnaces. Increasing numbers of individuals depend on their driving licence for continuing employment and the social stigma of epilepsy in personal life or at the workplace is profoundly disabling and affects marital prospects, recreation and physical rehabilitation. The prospective risk of post-traumatic epilepsy has an important influence therefore on quantum.

Damage

Damage to the central nervous system (brain and spinal cord) can result from the thermal and mechanical effects of electrical shock as a result of coagulation necrosis (death of tissue due to clotting of blood vessels), reactive gliosis (increase in nonneural support cells within the central nervous system as a response to injury), demyelinization (destruction of the protein which covers many of the nerves), vacuolization (small holes within the brain tissue), and perivascular hemorrhage (small areas of bleeding) [4]. Damage to the central nervous system can also occur as a result of cardiorespiratory arrest which results in anoxia or ischemic damage resulting from thrombosis (the formation or presence of clotting within a blood vessel which can cause infarction of the tissues supplied by the vessel). When fatalities occur, the cause of death is generally

attributed to ventricular fibrillation with subsequent cardiorespiratory arrest. Although relatively little research has been done on the neuropsychological changes following electrical injury, many patients report such symptoms as confusion, altered consciousness, visual disturbances, memory loss, psychomotor difficulties, diminished intellectual functioning, and aphasia.

Brain Injury

The complexity of the brain renders its normal functioning—especially the production of consciousness— uniquely vulnerable to acute metabolic derangements and structural deformation [5]. As a perpetual glucose and oxygen glutton, the brain is extremely intolerant of sudden changes in energy homeostasis and in vivo neurons begin to die after only minutes of fuel deprivation. Likewise, the diffuse circuitry responsible for consciousness in the brain makes anatomic insults involving both cerebral hemispheres and the brainstem reticular activating system necessary and suffi cient to perturb mental status. Regardless of etiology, altered mental status (AMS) or brain failure frequently prolongs hospital length of stay and worsens the prognosis of patients in the critical care setting. Rapid diagnosis is necessary to differentiate imminently life-threatening brain failure from more benign, reversible forms. As an amalgam of evidence-based practice and our clinical experience, this chapter will focus on the diagnostic and management challenges of AMS in the intensive care unit (ICU).

Neurology, psychiatry and clinical psychology have complementary and overlapping relationships in the assessment of organic brain damage but the neurologist is probably particularly equipped by training and experience to assess the Significance and prognosis of psychological sequelae from head injury [1]. Brain damage resulting in personality change or cognitive impairment is often characterised by objective neurological abnormality which allows more firm support for neurological opinion than a psychoanalytical assessment where theory most usually takes the place of observed fact. The measurement of cognitive impairment by psychometric testing is a most valuable tool in support of a clinical assessment of impaired brain function. And similarly the psychiatric assessment of disturbed behaviour and emotion is important in reinforcing the neurological signs of focal or multifocal brain damage.

Traumatic Brain Injury

TBI (traumatic brain injury) may be thought of as a subset of acquired brain injury (ABI), which includes not only TBI but stroke, hypoxic hypotensive injury, infectious disorders like encephalitis, and brain tumors [6]. TBI may be classified into two broad categories—open and closed—based on whether or not the meninges remain intact. Open head injuries occur when the scalp, skull, and meninges are penetrated, as in a gunshot wound. Closed head injuries typically result from mechanical forces. For example, if a moving head comes in contact with a stationary surface (e.g., automobile dashboard or windshield) or if the head is struck by a moving object (e.g., with a baseball bat or pipe), resulting in skull fractures and tissue damage to the underlying brain surface. Another common mode of injury is acceleration-deceleration, in which the moving head suddenly stops but the brain continues to move in the original direction and then suddenly reverses its path. Once the brain collides with the inside surface of the skull, areas of contusion result. The point of initial impact is referred to as coup, and when the brain rebounds in the opposite direction and impacts another surface of the skull, contrecoup. Injury may also occur when the brain is scraped across the rough inner surfaces of the skull, particularly at the base of the skull. The orbital and lateral surfaces of the frontal and temporal lobes are vulnerable to this type of injury. These contusions and abrasions result in focal lesions. A different type of brain damage that often occurs during the acceleration-deceleration process is microscopic, that is, at the level of the brain cell axons. The jerking and/or twisting motion of the brain during acceleration and deceleration may result in axonal stretching, shearing, and tearing. This type of injury results in widespread damage termed diffuse axonal injury (DAI). Thisdamage results indisrupted neuronalcommunication among various brain regions. TBI is characterized not only by the primary damage (i.e., focal and diffuse lesions) just described, but also by a variety of secondary factors, such as infection, oxygen deprivation, brain swelling, and elevation of intracranial pressure.

Conclusion

Neurology is a branch of medicine that deals with disorders of the nervous system. It primarily deals with the description, explanation and treatment of diseases caused by pathological processes and structural damage of the central (brain and spinal cord) and peripheral (peripheral nerves) of the nervous system. Neurology is primarily concerned with the causes of focal neurological outbreaks, or signs of illness that respond to the loss of function of certain parts of the body: visual disturbances that can not be explained by eye diseases, dysfunction of the muscle of the face, speech interference, consciousness disorders. The weight of the symptoms is very different, so is the treatment. In many cases, the symptoms

gradually get spontaneously withdrawn, even after setting up a proper diagnosis to exclude neurological diseases whose prognosis is much heavier. In cases with severe symptoms which are not spontaneously withdrawn, except to other neurologists, it will be necessary to be consulted psychiatrists or specialists from another area, depending on the type of symptoms.

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