

Deficiencies of the physical examination of the nervous system among medical students

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The neurological examination serves several purposes. It documents the occurrence of, and the anatomical level of the neurological lesion, and whether urgent management is needed. The unexpected finding of symptomless signs such as papilledema or extensor plantar response will significantly alter improper provisional diagnoses such as tension headache or hysterical weakness. The initial information gained from physical examination can enable the doctor to select the proper and cost-effective investigations. It is therefore, too difficult for the current highly advanced technologies such as spiral CT or MRT to replace the skills of physical examination.

Our impression as clinical teachers is that the skills of the medical students in neurological examination are considerably weak, in our country and abroad.^{1,2} Neurological cases have earned the reputation with students of being difficult to diagnose, and time consuming. With the availability of modern investigations, many patients are either managed in the outpatient clinics or have a very short stay at hospital. Consequently, the number of cases available for the teaching clinical rounds are considerably decreasing. The students lack the necessary scientific principles of neurological diseases. Locally and abroad there is a marked deficiency in trained neurologist physicians.¹ The non-neurologist teachers may tend to escape the neurological cases due to their unfamiliarity with this specialty or for being time-consuming, the students may find difficulty in appreciating the age-related changes of the elderly such as loss of ankle reflex or impairment of vibration sense. This study aimed at documenting the patterns of errors made by medical students on examination of the nervous system. We also suggested some solutions to this problem.

The subjects of our study were the fifth-year medical students of the University of Bahr Elghazal during the academic year 2002-2003. During this year, we conducted a weekly teaching clinical round in a neurological unit for 4 groups of 15 students (a total of 60 students). The study assessed the basic skills of neurological examination through detection of the following errors:³ 1. Errors of technique: poor ordering and organization and improper manual techniques or use of instruments. 2. Errors of omission: not performing part of the examination. 3. Errors of detection: missing a sign that was

present or reporting detection of a sign that was not present. 4. Errors of interpretation: failure to understand the meaning of an identified sign in pathophysiological terms or lack of knowledge or use of confirmatory signs.

For this study each student was asked to perform a complete neurological examination to cooperative patients with clear-cut physical signs. The examination comprised: i. Mental state examination: consciousness, speech, memory, mood, concentration, appearance and behavior. ii. Cranial nerves. iii. Motor system: inspection, tone, power, reflexes, coordination, gait. iv. Sensory system: touch, pain, temperature, position, vibration, cortical sensation. v. General inspection: skull, back. We attended the whole examination. Immediately at the end of the each round, we recorded the errors made by the students. The study was based on errors made by 3 or more students. A total of 60 neurological examination were performed. Below, we will list the patterns of common errors made by the students.

Errors of omission. Examination of the skull, examination of the back, testing of the pupils, testing the central visual field, testing for clonus in patients with hypertonia, inspection of the muscle bulk. Assessing the nature, rate and rhythm of the abnormal movements, applying reinforcement techniques for diminished reflexes, testing power of the trunk muscles, testing cortical sensation, and testing for a sensory level in paraplegic patients.

Errors of technique. Use of unfamiliar or irritant substances to test olfaction, patient not wearing his spectacles while testing the optic nerve, failure in use of the ophthalmoscope, touching the conjunctiva instead of the cornea in testing the corneal reflex, patient not looking at the examiner's eyes during confrontation test. Examination of the superior oblique muscle by looking upward (instead of looking downward and inward). Unnecessary exposure of genitalia while examining the lower limbs, tapping on the muscle tendon away from the insertion point, applying pressure proximally on eliciting patellar clones, holding finger too near to the face on performing finger-nose test. Eliciting tendon reflex with the limb in the neutral position, use of stethoscope or fingers to elicit tender reflexes. On testing tone, applying pressure too quickly (so undue resistance is generated). Use of improper substances as paper or tips of fingers to test touch sensation. Not demonstrating the 'up' and 'down' on testing position sense, use of 256 Hz tuning fork to test vibration, and testing sensation too quickly so that summation of impulses may occur.

Errors of detection. Failure to differentiate between motor and sensory aphasia, confusion of memory defects with dysphasia, failure to

differentiate between recent and remote memory defects. Detection of mild degrees of facial paresis, confusion of excessive blinking to nystagmus. Failure to differentiate between nerve and conductive deafness, failure to recognize cases of partial ptosis, failure to detect bilateral facial weakness, failure to differentiate between spastically and rigidity, failure to detect mild degrees of paresis, failure to accurately establish the higher end of sensory loss, and failure to differentiate between associate and dissociate sensory loss.

Errors of interpretation. Interpreting an absent jaw reflex as indicating lower motor neurone lesion (LMNL), interpreting weakness of mastication muscles as a facial nerve lesion. Confusion in distribution of the sensory divisions of the trigeminal nerve. Misinterpreting the normal down going plantar reflex as an indicator of LMNL, misinterpretation of the LMNL signs of the neurogenic shock phase of upper motor neurone lesion. Misinterpretation of symmetrical exaggeration of all reflexes (due to anxiety or tension), misinterpretation of absent abdominal reflexes in obese or elderly patients, misinterpretation of muscle tension generated by expected pain, cold or anxiety as hypertonia. Misinterpreting bilateral ankle clonus in a tense patient as a pyramidal sign. Lack of knowledge of dermatomes of individual sensory roots, and failure to accurately qualify the sensation abnormality.

Our study clearly indicates a deficiency of the skills of neurological physical examination. A large proportion of errors were in the examination of the motor system. What is commonly missed is inspection of limbs, which can yield important information such as muscular atrophy, fasciculation and other involuntary movements. Only with short-term experience will it be possible to judge whether tone is increased or decreased. Students should be aware that factors such as nervousness, cold, and actual or expected pain will cause the patient voluntarily to resist the examiner's movements and makes the test difficult. Some patients try to help the examiner by doing the movement themselves, which are presumed to be passive! To remain relaxed throughout the test the patient may need to be distracted with conversation while performing the test.

As with the tone, the differentiation between the normal power and mild grades of weakness depends on experience. Here, the golden rule is always to compare with the sound limb. Some students complain that power testing is lengthy and may generate discomfort or annoyance to the patients. In practice, the detailed examination of the individual muscles is rarely indicated unless there is atrophy or if examination indicated weakness. Instead, testing of representative muscle groups of flexor or

extensor groups may be sufficient. Sometimes the detailed power testing is necessary to identify the pattern of weakness (for example, due to a nerve root or a single peripheral nerve lesion). The grading of weakness is as important as documenting it, especially in detecting the degree of recovery or deterioration in future follow-ups.

There are several pitfalls in testing the tendon and superficial reflexes by both students and junior doctors. The students tend to ignore the reinforcement of diminished reflexes (which produce partial muscle tension and then all stretch reflexes are increased). The symmetrical hyperreflexia in presence of downgoing reflexes is usually normal, and may be caused by anxiety or tension. The abdominal reflexes can be lost or diminished in obesity, multiparity, the elderly or simply by repetitive stimulations.

The examination of the sensory system is considerably difficult as it depends on the cooperation and intellectual capacity of the patients. Even more, the intelligent patient may remark upon slight but insignificant sensory changes and then confuse the examiner. The less intelligent patients may not understand what is required of them (for example, the direction of the toe in position test, or the vibration reception). The individuals vary considerably in their reaction to sensory stimuli. At the same time, the examiner himself may find difficulty in maintaining the uniformity of his stimuli. For these factors, the sensory examination may be a source of pitfalls and errors, even for experienced clinicians (let alone beginning students!). The students tend to view sensory disorders as only a loss pattern disregarding other disturbances such as hypo or hyperesthesia. The subjective changes such as tingling, paresthesia or numbness should not be forgotten. Also, the diagnostic value of sensory testing is much decreased by the students' ignorance of dermatome distribution in the body.

Clinically not all the 12 cranial nerves are of the same weight. Some of them such as the optic, ocular and facial nerves may indicate common and serious diseases. On the other hand, the routine testing of the olfactory nerve rarely contributes to solution of a neurological problem. We, unfortunately, notice the absence of any training in ophthalmoscopy for medical students.

The association of the mental state to the organic health is beyond doubt. The students not only ignore the relation of emotional state to organic disease, but they confuse them for each other. For example, they confuse apathy with depression and euphoria with anxiety. Many errors in mental state examination can be avoided by emphasizing that many of the mental changes can be observed during history taking. Also, we should not embarrass more alert patients with offensively simple questions such

as orientation to place or time. In fact, the family or concerned friends and employers are more likely to bring even the mildest mental changes to attention.

The skills of neurological examination can easily be learned, but confidence and reliability come only from continued application.^{4,5} At the beginning, students should be encouraged to frequently examine the nervous system even if it is clinically normal (thus errors of omission can be avoided). Training of students in a series of patients with multiple signs with close monitoring by experienced teachers, will minimize errors of technique and detection of signs. Detailed knowledge of clinical anatomy and patho-physiology of the nervous system is essential before embarking on neurological examination. We suggest organizing short revision sessions on the basic neurosciences at the start of the clinical phase of the school curriculum, especially on topics such as

organization of motor and sensory systems, cerebral circulation and pathways of cranial nerves.

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