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THE NEUROPSYCHOLOGICAL METHODS OF O. LURIA: THE CASE STUDY APPROACH

НЕЙРОПСИХОЛОГІЧНІ МЕТОДИ О. ЛУРІЯ: КЕЙС-СТАДІ

Ключевые слова: диагностика головного мозга, *нейропсихологические методы, моторная методика Лурия, аффективные состояния, психические процессы, нейропсихологические синдромы.*

Анна Діана Сивковська, Олеся Павлюк. Нейропсихологические методы А. Лурия: кейс-стади.

В статье рассматриваются нейропсихологические методы, разработанные А. Лурия для топической диагностики локальных поражений головного мозга. Методы А. Лурия используются современной нейропсихологией для изучения нейропсихологических синдромов. Используя метод *кейс-стади* авторы на клиническом случае рассматривают диагностические функции методов А. Лурия и подтверждают, что основное их назначение – определение тех отделов мозга, которые находятся в патологическом состоянии, то есть выявление нарушенных звеньев функциональных систем и их системных последствий.

Introduction. Neuropsychological test batteries shows their greatest reliability and validity in patients with focal, defined neurologic problems, disease. The test profiles highlight focal areas of strengths and weaknesses in the brain. The clinical utility of standard test batteries and their reliance on scaled score differences is limited when patients with severe or diffuse neurobehavioral disorders are evaluated.

In this case was applied the qualitative approach of Olexandr Luria to the neuropsychological evaluation of a severely impaired adolescent, unable to complete psychometric tests. Luria's method was able to assist in the localization of the brain dysfunction and the neurologic diagnosis of a young patient with an unusual neurologic presentation secondary to serious multisystem disease. The initial neuropsychological diagnostic impressions were later confirmed by diagnostic testing.

History of research. Some information about Alexander Luria. He was born in 16.07.1902 small city in Russia – Kazan and died in 14.08.1977 in Moscow. He was absolvent the Kazan Psychoanalytic Association. His inspiration come from Freudian ideas method analysis he was corresponding with Zygmunt Freund. In 1923 Luria worked at the Institute of Psychology in Moscow, where he development a psychodiagnostic procedure he referred to the combined motor method for diagnosis individual subject though processes (A. Luria 1923)¹. In this method a person is asked to carry out three task in the same time: one hand is to be held steady while the other is use to press e.g. a key is respond to verbal stimuli

presented by the experiment, to which person is asked to respond verbally the first word that comes to his mind.

In 1924 A. Luria with L. Vygotsky sought to establish approach in psychology that would enable to discover the way natural process such as physical maturation and sensory mechanisms become intertwined with culturally determined processes to produce the psychological function of adults.

An alternative qualitative and “investigative” method to aphasic disorder was first suggested by O. Luria. Attempts to standardize and normalize his original procedures have led to changes in the original intent of his approach, with more emphasis on psychometric data (Adams 198, Adams 198 and Golden 198). Luria (1966, 197), stressed that a patient's inability to perform a certain task does not necessarily specify an area of brain dysfunction, since each behavioral task requires the coordinated and integrated activity of a number of cortical and subcortical areas, all contributing differently to the execution of the task. The various ways in which the patient attempts to perform assigned tasks may shed light on the patterns of brain dysfunction, common to a number of intellectual, memory, abstraction, sensory, and motor skills. It is the commonality of the deficit skills of a number of tasks, rather than the specific nature of the incorrectly performed tasks, which allows the clinician to determine the areas of brain dysfunction².

Luria's investigative method was used in the clinical evaluation of an unusual focal, neurologic presentation in a young male with serious multisystem disease and en-

cephalopathy. This approach helped us to correctly localize a brain dysfunction, later confirmed by neurodiagnostic testing, and to provide recommendations for ongoing neurorehabilitation of the patient.

Medical history. AM, Arab male a 15-year-old was good health until the age of 8 years, when he was referred to our hospital for evaluation of general weakness, abdominal pain, and blood-stained vomiting. The past medical and family history were noncontributory. The clinical and laboratory findings of acute renal failure and anemia suggested a diagnosis of atypical hemolytic uremic syndrome, a diagnosis provided to renal biopsy. Since renal function did not improve and hypertension was not controlled, peritoneal dialysis had to be initiated, approximately 2 months after the start of AM's illness. During the next 5 years he was on continuous ambulatory peritoneal dialysis. In September 1993, the boy underwent an unrelated living donor renal transplantation outside Israel.

Neurodiagnostic test findings. A neuropsychological evaluation was performed after AM's third generalized seizure. At the time he had episodes of "catatonic behavior" and repeated screaming outbursts with frightening visual hallucinations. His cognitive ability worsened after each seizure and, although he recovered some behavioral and neuropsychological skills after each seizure, he never fully regained the level he had attained after the preceding ictal event. Three computed tomographic scans (CT) of the brain were within normal limits. Standard electroencephalograms showed no significant abnormalities. Psychiatric evaluation of this patient resulted in the diagnoses of catatonia and a schizophrenic reaction. He had a marked Cushingoid appearance, due to 3 months of use of corticosteroids. AM was short in stature, relative to his age, with deep yellowish-olive skin color often seen in young patients with chronic renal failure and those undergoing dialysis therapy. AM's premorbid ability had never been formally assessed, but his past schoolwork. Review of his school notebooks showed extremely neat and orderly handwriting without evidence of dysgraphia, with good copying skills, although some spelling errors were observed.

AM was well-liked by the medical personnel, and was described as a polite, young adolescent who came for follow-up well-dressed, often wearing a bow tie. AM lives in a small, agricultural, traditional Arab village in Israel/Palestine. He was a pupil in a local elementary school. His premorbid intelligence quotient was estimated to be within the average to low average range (25–50%tile). There were no reported memory, language, or learning problems in school. After the kidney transplant he ceased his formal education. AM's social adjustment and social skills were also reported to be average for his age.

Neuropsychological evaluation. At the preliminary conversation with AM, it is observed a 15-year-old boy with labile emotions, varying from flat and nonresponsive to serious and smiling. The patient shook the examiner's hand slowly after being greeted in Arabic. AM speaks Arabic as his primary and mother tongue, however, he understands and speaks rudimentary Hebrew. AM was tested in Arabic and there was an interpreter

present. He was not able to recognize the face of his social worker, whom he had known for many years, indicating the severity of his memory disorder. His ability to concentrate and sustain effort on most tasks was extremely impaired, suggesting inefficiency of his subcortical diencephalic or fronto - diencephalic arousal centers. No reliable standardized test results could be obtained from AM at this time, as all scores were more than three standard deviations below the normal value for his age. The tests assessed the following areas of functioning: executive/abstraction, perceptual-motor, motor, attention, memory, graphomotor, and visual-motor integration. Investigation of motor functions was performed by: the Purdue Pegboard Test, Luria's Graphomotor Tasks, the Beery Test of Visual Motor Integration, Trail Making Tests A and B from the Halstead Reitan Neuropsychological Battery (Arabic version), the Kaufman K-ABC Mental Processing Scale, and the Draw-a-Person Test³.

"Individual Analyzers". AM apparently showed intact orienting responses to tactile, auditory, and visual stimuli. Visual tracking and gaze to verbal commands was slowed and deliberate, without evidence of visual neglect or visual field cuts. However, the recognition of visual objects and familiar faces was impaired; suggesting the possibility of either mesial-frontal lobe or diencephalic dysfunction associated with pathological inertia (e.g., abulia), related to slowed or fragmented gaze and decreased visual perception. The ability to recognize or name colors and the discrimination of sounds was markedly impaired. Observation of the patient's behavior during the tests showed a Parkinson's-like syndrome. His inability to recognize the medical personnel suggested a visual memory disturbance, possibly prosopagnosia. He was aware of his inability to correctly respond to a question and demonstrated appropriate anxiety and frustration.

Motor Functions. In a number of tests, the patient was unable to initiate a cognitive or motor response to verbal instructions, but could perform the task when given a concrete visual cue, prompting, and/or physical assistance. He often perseverated, repeating whole sets of previously executed behaviors, suggesting anterior, mesial fronto-temporal lobe dysfunction, and loss of inhibitory control over behavior. In other attempts to have AM produce written responses, he demonstrated micrography. Similarly, he could not correctly reproduce sequences of hand movements when presented by the examiner. AM also had bilateral intentional tremors.

Higher Visual Functions. The patient was observed to have difficulty naming colors to confrontation testing. He also could not correctly name simple figures on a Gestalt Closure Test, often perseverating on simple concepts, such as shapes (e.g., square or circle).

Mnemonic Processes. On tests of object recognition after brief presentations, memory for a word list, and acoustic memory testing, AM was severely impaired. He had difficulty in recalling series of numbers and words. He had long-term memory deficits, including failure to recall familiar faces and prior school experiences. He also did not recognize the examiner when he saw her on repeated testing sessions, indicating continued recent and

long-term memory deficits. This suggested orbito-frontal as well as mesial temporal lobe dysfunction.

Speech Functions-Receptive Speech. AM could only respond consistently to one-step commands. He had difficulty responding to two- and three-step commands and often became perseverative in his responses. These findings were suggestive of both temporal lobe and orbito-frontal and anterior frontal lobe dysfunction

Speech Functions-Expressive Speech. The patient was able to produce only single words in his native language (Arabic). There was no ability to produce sentences or even brief meaningful phrases. Again, anterior frontal lobe dysfunction was suggested.

Writing and Reading. As noted above, the patient could not reliably read written language and produced micrographic and perseverative writing. The patient also had problems with the sequencing of numbers. He was unable to identify letters or numbers, but could write them in a way that appeared automatic. He could not write them on request, but at one point began writing letters after initiating subsequent tasks; evidence of inability to release from a previous cognitive set. The way he wrote the letters and numbers seemed to indicate an ideomotor dyspraxia. AM was re-examined four times within 1 week; the tests revealed interval improvement, particularly in fine motor coordination and motor speed, as measured by the Purdue Pegboard Test and in writing his name. He was still unable to answer questions involving simple arithmetic, solve tests of Gestalt, or do Trails A or B⁴.

Arithmetical Skill. The patient couldn't complete simple or complex written or oral tasks, had mathematic problems, was unable to calculate. This symptoms are for angular gyrus of inferior parietal lobule disturbed.

Intellectual Process. The patient was perseverative and had great difficulty switching between cognitive sets. His speed on set switching tests was also severely slowed, more than four standard deviations below the level for his age. The neuropsychological functions associated with limbic structures and anterior fronto-temporal

Conclusion. The patient's rapid, partial recovery following each seizure progressive structural damage to subcortical and cortical areas. But, his persistent memory dysfunction suggested a moderate degree of interference from traces of previously learned material, which disturbed the memory of sequences of hand and legs movements, words, figures, or shapes; and deficits in procedural memory, independent of modality of presentation. This retrieval and production deficit for motor sequences as well as verbal and nonverbal material, suggested disruption in pathways associated with bilateral orbito-frontal and anterior frontal cortex, including diencephalic structures. This is in contrast, lateralized memory defects found in patients with localized lesions within the hippocampus or other mesial temporal lobe pathways. AM's awareness of his inability to recall previously presented material also differed from the lack of a "critical attitude" (e.g., awareness of deficits), generally present in patients with significant involvement of frontal or anterior temporal lobe regions.

AM's perseveration of whole sets rather than specific items also indicates a deeper cortical dysfunction, as op-

posed to a superior frontal-cortical defect. The generalized fluctuations in the deficits over time seemed to indicate a general disturbance of cortical tone. The type of catatonia described by the physicians disturbance of cortical tone, as described by A. Luria. The apparent "psychotic disorder" diagnosed by the psychiatric consultant, clearly suggested an anterior, medial temporal lobe phenomenon commonly seen following complex partial seizures, rather than a functional psychiatric disorder. All these symptoms, together with the patient's markedly inappropriate affect, hallucinations, difficulty or inability to initiate tasks, and motor retardation, suggested a syndrome described by Luria as consonant with a deep bilateral fronto-orbital and temporal disturbance involving the circuit of Papez connecting the entorhinal cortex to the cingulate gyrus and fimbria via hippocampus, fornix, hypothalamus, and mammillary bodies. This "temporal lobe personality syndrome" has also been documented by others Bear & Fedio 197.

In the case of AM, the clinical and neurodiagnostic findings indicated severe central nervous system involvement in a young patient with chronic renal failure after renal transplantation. The following differential diagnoses were considered to explain these findings: hypertensive encephalopathy with or without structural changes (e.g., bleeding); infection in an immune-compromised host; metabolic encephalopathy. The only diagnosis we could exclude with certainty was infection. Blood and cerebrospinal fluid cultures were and remained negative. The dose of corticosteroids the patient was receiving was not excessive, and the laboratory and neuropsychological findings were not typical for central nervous system (CNS) steroid intoxication.

The patient had hypophosphaturia, a metabolic derangement not uncommonly seen in the post-transplant period, which can have major effects on the CNS, including changes in behavior. When blood phosphorus levels returned to normal, no concomitant improvement was observed in neuropsychiatric symptomatology. Renal artery stenosis of the graft was excluded following a normal Doppler-duplex study of the renal artery. Consequently, only hypertension control remained as a probable etiology, since high blood pressure persisted throughout the course of treatment and was resistant to a plethora of medical treatments. The hypothesis was a severe atypical hypertensive encephalopathy. Since the native kidneys are generally the cause of excessive hypertension after renal transplantation, and they did not contribute to the overall renal function because both were removed. The subsequent course showed persistence of the hypertension although the blood pressure was better controlled than before. Only the sphenoidal EEG showed abnormality with an antero-medial fronto-temporal lesion, likely involving the circuit of Papez. The EEG finding the independent neuropsychological diagnosis derived from clinical observation. The cause of this brain lesion remains speculative. Since such lesions may be seen in patients with acute anoxic episodes, we hypothesize that AM may have experienced anoxic encephalopathy in the region of the anterior communicating artery and its associated capillary beds during anesthesia at the time of the renal transplant operation.

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- ³ Clinical Neuropsychological testing [Electronic version]: http://www.slideshare.net/shilpa_prajapati/clinical-neuropsychological-testing
- ⁴ Teuber Milner Corkin The Legacy of Patient H.M. for Neuroscience(1968) [Electronic version]: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2649674/>

Сівковська А.Д., Павлюк О. Нейропсихологічні аспекти методи О. Лурія: кейс-стаді. У статті розглядаються нейропсихологічні методи, розроблені О. Лурія для точної діагностики локальних уражень головного мозку. Методи О. Лурія використовуються сучасною нейропсихологією для вивчення нейропсихологічних синдромів, тобто для виявлення первинного дефекту і пов'язаних з ним вторинних порушень вищих психічних функцій. Досліджуючи в 20-х роках ХХ століття афективні стани людини, Олександр Романович розробив пов'язану моторну методику, що виявляє приховані афективні комплекси. Надалі, працюючи з Л. Виготським, О. Леонтєвим та іншими вітчизняними психологами, розробляв культурно-історичну теорію розвитку людської психіки.

Експериментальні дослідження О. Лурії, присвячені проблемам мозкової локалізації вищих психічних функцій і їх порушень при локальних ушкодженнях мозку, послужили основою формування концептуального апарату і феноменологічної бази нейропсихології, а також вироблення системи методів нейропсихологічної діагностики.

Автори стверджують, що теоретичною основою методів О. Лурія є уявлення про системну динамічну локалізацію вищих психічних функцій, згідно з якими мозок як субстрат психічних процесів функціонує як єдине ціле, що складається з диференційованих за своїми функціями відділів.

Використовуючи метод кейс-стаді автори на клінічному випадку розглядають діагностичні функції методів О. Лурія та підтверджують, що основне їх призначення – визначення тих відділів мозку, які знаходяться в патологічному стані, тобто виявлення порушених ланок функціональних систем і їх системних наслідків.

Ключові слова: діагностика головного мозку, нейропсихологічні методи, моторна методика Лурія, афективні стани, психічні процеси, нейропсихологічні синдроми.

Олеся Павлюк – кандидат політичних наук, викладач кафедри психології та соціології Буковинського державного медичного університету. Коло наукових інтересів: самооцінка особистості, комунікативні здібності підліткового віці, зовнішня політика США, інтереси Сполучених Штатів на Близькому та Середньому Сході, американська політика економічних обмежень щодо Ірану, стримування агресора у півполярній системі міжнародних відносин. Автор трьох монографій (у співавторстві), понад 50 наукових статей та публікацій, учасник міжнародних навчальних курсів, тренінгів та семінарів в Німеччині, Польщі, Чехії, Болгарії Росії, Молдові.

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