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Neuro-advise: A comprehensive multi-functional clinical decision support system for diagnosis of neurological disorders

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Abstract

Although neurological disorders are one of the most serious health threats leading to disability and death worldwide, misdiagnosis is a relatively common challenge in neurological practice that can result in inappropriate delivery of healthcare services and long-term adverse outcomes to the patient. Many diagnostic errors can be prevented by a focused neurological examination and a rapid access to diagnostic possibilities. Compared to routine practice, this targeted approach is performed faster and is more precise. Neuro Advise is a medical application that offers a practical guide to focus examination, differential diagnosis, and step-by-step investigation of neurological syndromes with an artificial intelligent expert system. The application covers most of the clinical syndromes, anatomical lesions, and neurological disorders and can be used by neurologists, neurosurgeons, general physicians and all other healthcare professionals involve in neurological patient care. The main features of NeuroAdvise application including "Clinical Approach", "Anatomic Approach", and "Paraclinical Approach" provide a unique list of differential diagnosis for any patient according to underlying demographic and clinical characteristics.

Keywords Neurological disorders; Neurodegeneration: Neurology

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Introduction

Clinical Approach" provides a targeted examination program and helps in lesion localization. "Anatomic Approach" helps in evaluation of anatomical lesions. "Paraclinical Approach" helps in interpretation of test results such as neuro-radiological abnormalities. In general, the application helps healthcare professionals in making better clinical decisions and improves neurological patient care.

Development of a disease stage classification for AD has not been a simple process, nor is there complete consensus with the system(s) that are in place. Definitive staging of disease state remains a judgment call decided in clinicopathological conferences between clinicians, neuropsychologists, and pathologists. A major deficiency in the staging system is that it can only be approximately applied in the living subject. Since AD pathology is determined at autopsy, a clinical diagnosis of probable AD has to be used instead. The lack of an in-life diagnostic test greatly hampers research efforts on disease mechanisms, and is a particular problem for clinical trials as it introduces additional heterogeneity into the subject population.

Why Aβ deposition is only weakly related to the degree of dementia has been an enduring puzzle in the AD field. While potential floor or ceiling effects in the amount of Aβ deposition could contribute, there is also the possibility that Aβ exerts its major effects early by triggering a cascade of processes that, once begun, proceed independently of Aβ. Some support for this argument might be found in the human Aβ immunization trial (AN-1792). Although the numbers of individuals to come to autopsy is still very small, the brain Aβ deposition in these cases was far lower than might be expected based on historical levels for a given clinical stage. In spite of this markedly lower amount of Aβ, presumably caused by the immunotherapy, the subjects continued to decline cognitively to an end stage dementia that was clinically indistinguishable from untreated AD.

This is not iron-clad proof that the removal of Aβ succeeded, since we have no way of knowing the pre-treatment amyloid load, and the number of cases is too small for a true cross sectional comparison. It is tempting to speculate that the implication of these results is that Aβ acts as a trigger for a degenerative process that continues even if it is removed

It is not clear what the mechanism might be for this continued degeneration, although a continued accumulation of misfolded hyperphosphorylated tau, leading directly to further neuron loss, is perhaps the most likely candidate. However, this is a difficult hypothesis to test because it requires the reliable identification of subjects with AD at a very early, preclinical stage, a feat that is currently not possible even with the most sensitive and dependable means of diagnosing the disease.

Another possible explanation is that a specific form or forms of Aβ are responsible for the massive neuronal death that accompanies the disease. The tools used to quantify Aβ are not able to distinguish the disease-related Aβ from less relevant forms which weaken the correlation with clinical stage. An analogy of this situation is found in prion diseases in which the same protein sequence can assume multiple disease-causing conformations, each causing neurodegeneration in a distinct distribution of brain regions resulting in different clinical presentations [4, 5]. In this review we suggest that Aβ is also polymorphic, producing conformational form(s) or specific pool(s) of Aβ that are disease-relevant while others are less so. Progress is being made in methods and systems to delineate these relevant forms, which will allow testing of this hypothesis.

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fracture produces surrounding muscle and tissue damages. Our results confirm that Anterior Approach reduces other damages and amount of blood loss during the operation [9-14].

Moreover, AMIS is characterized for literature by few complications like operative fractures or dislocations [15-18]. The repetitiveness of technique is demonstrated by the absence of surgery complications even in young group. Another important aspect is the timing of post-operative functional mobility that is observed to be shorter in Anterior Approach [3,19,20]. All patients started to walk the first day post-operative [21]. This is due to the muscle saving [22] and the absence of lateral femoral cutaneous nerve palsy [23]. This result is confirmed by the shorter recovery time, without significant differences between the two groups of patients [15-24].

Conclusion

AMIS is confirmed to be a surgical approach characterized by few complications, reduced blood loss, muscle sparing and small incision that allow optimal outcomes and an immediate start of walking with complete load even in hemiarthro plasty in neck fractures of elderly people. Moreover we demonstrated that the approach in simply repeatable even for young surgeons. For this reason AMIS can be preferred to other approaches not only for arthritis, but even in neck fractures, for hemiarthr oplasty and not only by expert hip orthopaedic surgeons.

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