Neuroimaging: Preface

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The World Federation of Neurology (WFN), which follows all new developments in neurologic science and its applications, realized the significance of modern brain imaging technologies and the need to stimulate neurologic interdisciplinary influence on these new approaches. In anticipation of further developments, the WFN responded to the proposals of a group of experts in 1981 by organizing a new research group on neuroimaging within the research committee of the WFN.

In our century new imaging technologies represent the most dramatic progress in neurological diagnostic procedures. After the revolutionary detection of X-ray in 1895, it took more than five decades to develop a second way of imaging, i.e., nuclear medicine. Ten years later the ultrasound technique was put into diagnostic use. Some 15 years ago computer tomography (CT) was invented, and 5 years later the principle of magnetic resonance (MR) was described (Fig. 1).

The term "neuroimaging" designates the capacity to visualize the morphological and functional features of a pathological condition within the CNS. Enclosed and hidden within the osseous structure of the skull and vertebral column, the CNS is withdrawn from direct examination.

For a long time the neurologic examination indicated the topographical feature of a lesion, and classical radiology brought a certain degree of visualization of lesions within the CNS, but the image showed mostly a silhouette of lesion or a compressive distortion of certain structures. Angiography came closest to producing a direct, positive image; however, the increased accuracy achieved was accompanied by increase in the agressiveness of the procedures.

The capability of CT to demonstrate the geography and character of both normal and abnormal intracranial structure, without the necessity of intrathecal or intra-arterial contrast studies, has altered the approach of the neurodiagnosis to clinical CNS problems dramatically. MRI has made further major contributions in both basic neuroscience and clinical use.

MRI has appeared far more sensitive in detection of a lesion than CT, but at present the histologic specifity and tissue characterization of MRI appears to be less than that of CT. However, CT and MRI now represent the standard imaging method for in vivo neuropathology or "living neuropathology." The introduction of

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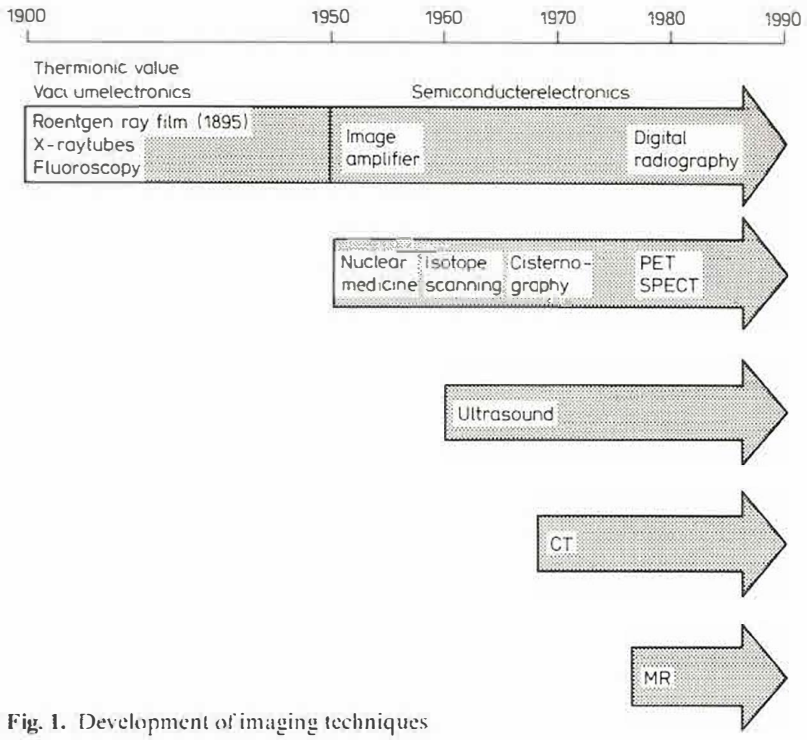

Fig. 1. Development of imaging techniques

MRI in neurologic practice has added an important and valuable diagnostic role to our armamentorium [1].

During the last two decades, clinical brain research has taken a step forward because of the development of methods for measuring regional brain functions. The practical applications of positron emission tomography (PET) in the diagnosis of brain disease are limited to tumors, certain types of epilepsy as well as cerebrovascular disease (CVD). The hopes that PET might enable us to unravel some of the secrets of the brain has attracted to it researchers in areas of physics, electronics, radiochemistry, biochemistry, physiology, and the clinical neurosciences.

In this enthusiasm, very few have called attention to the very serious threat posed by the uncontrolled utilization of this procedures to the education and training aspects of neurology, as well as to the health and welfare of patients. How frequently does the practitioner get a sense of false security about his headache or seizure patient when told that the MR scan is normal? How many patients are told that the MR scan will save them the expense of a neurologic consultation, when in fact they pay more? Is the MR and PET scan indeed better in the detection of early lesions than the CT scan? Are they reducing the cost of health care, or adding to it?

The worldwide increasing number of neurologists includes the risk of overuse of the new technologies. While in 1963 only 1822 neurologists were registered in the USA, this number has increased to 5142 in 1980 [2]. The increased and generous use of the new imaging technologies does not lead congently to the benefit of the pa-

tients. Many additional examinations seem to add little information that cannot be obtained from a careful neurologic history and examination. Many neurologists expect their patients' problems to be solved by MR scanning and every patient demands it.

There is a serious need to find a middle course between blind acceptance of the new technologies as routine investigations, valuable procedures for an individuals' problem, and experimental studies research. In the years since the introduction of MRI, a multitude of studies have described the appearance of the MR image in a specific clinical condition. Few studies have attempted to analyze the overall clinical value of this new neurodiagnostic technique: in particular no study is available analyzing the influences and implications of MRI on therapy of neurologic disorders, which seems to be of great importance. Journalists have pointed to MR scanning as the latest example of technology run amok, driving up the cost of medical care [3]. The economic concern and controversy associated with the rise of new imaging technologies will be discussed in some of the following chapters.

All these considerations and others must cross the mind of the clinical neurologist who is concerned about mechanodiagnosis replacing his skill and experience in the diagnosis and management of neurologic disease, and the neurologic teacher who sees students opt for the MR scan instead of the more traditional approach. I believe that the following papers render an important service to neurologists and their patients by soliciting contributions from various groups and scientists able and willing to shed some light on these new important problems.

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