

Making use of ITA - the main clinical indications

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Dementia of Alzheimer Type (DAT)

Upon initiating with clinical testing of **ITA**, we were struck by the firm positive correspondence between the EEG changes obtained from consecutive individual recordings on the one hand and the deterioration of the symptoms on the other..

By recording 10 min resting-EEGs with fixed 12 weeks intervals, we observed a steady deterioration of the EEG as to be concluded from negative difference scores in about 75% of the patients with a clinical DAT diagnosis.

Though numerically very distinct, it was impossible to comprehend these differences by means of conventional visual evaluation.

Of special interest were the findings with patients who did not follow the monotonous deterioration pattern to be expected with DAT but who showed instead only minor fluctuations from recording to recording until – absolutely unexpected -a very distinct EEG improvement emerged. Such a seemingly paradoxical improvement was invariably accompanied by an improvement of cognitive test performance as well as by spontaneously reported mood improvement and a return of social interests. Thus, ITA gave rise to change the diagnosis from DAT to “Remitted involuntional depressive state”.

Among other patients with NMR proven cortical atrophy and a clinical deterioration in the preceding two years, the strictly unidirectional trend of EEG worsening to be expected with DAT could not be confirmed. Although deteriorating in the long term, interspersed phases of EEG-improvement, followed by a renewed deterioration was typical for that subgroup of patients. We interpret this pattern as the expression of a vascular component which seems often to play an important role with DAT(bouts of clinically unrecognizable multiple microinfarctions, microembolization). The possibility of temporary

improvement within the long term frame of deterioration has to be considered when ITA is used as a means to objectify a questionable nootropic drug effect.

Although we hitherto could not refer to supporting data, we see a good chance that the central problem of making up a true early diagnosis (i. e. with respect to the onset of the neuropathological process) may be solved by ITA.

DAT literature is dealing increasingly with this very problem:

It is long known to neuropathologists, but essentially disregarded by clinicians that the appearance of clinical symptoms is preceded by a gradual neuronal degeneration process of about 10-25 years duration. Due to the compensatory capacities of the brain, pertaining especially to slowly proceeding pathologic processes, clear cognitive *performance deficits* will not show up until more than 90% of neuronal tissue has disappeared. Whereas cognitive testing is only concerned with the measurement of performance deficits, it seems plausible that a trend towards deterioration could be objectified on the *functional level* much earlier, i. e. up to two decades before a clinical diagnosis becomes possible. Since the EEG **directly** reflects the ongoing mass activity of cortical neurons (but not the mechanisms underlying the brain's compensatory capacity), a decrease of the sheer number of functionally intact neurons should be reflected reliably. From the methodological point of view, recording in fixed intervals -at least twice a year- is required. For the purpose of preventive screening persons within the range from 50-65 years of age one should restrict follow-up investigations to clearly non-demented individuals within the range of 50-65 years of age. A deterioration trend across 3 measures at least, i. e. within 18 months, would be a strong argument for a clinically inapparent cortical process of degeneration.

Making a true early diagnosis of DAT could become the starting signal for preventive measures. Thus, as current research confirms more and more risk

factors, which can be influenced and possibly prevented by of certain drugs, for example the statins.

Moreover, the usefulness of any preventive treatment can also easily be evaluated by ITA.

Last but not least, it may be an ideal tool for reassuring the so-called memory complainers, well known to all memory clinics.

Depressive Syndroms

Particularly impressive are the unexpected distinct ITA score differences coinciding with remissions and relapses of depressive episodes. If one looks back to the era of pharmacoelectroencephalography with its essentially theory-free spectral-analytic transformation of the time function, it is noteworthy, that ITA difference scores (as resulting from a pre – and post-drug comparison) remain essentially unaffected by the type and dosis of the antidepressant drug therapy.

Addiction to Alcohol and other Drugs

A very distinct EEG-effect is also obtained very reliably as a consequence of the initial detoxification and, if successful, by the subsequent withdrawal therapy.

Compared to the initial recording that should be performed 7 days post admission, a marked improvement (indicated by a positive difference score) appears almost invariantly after a one-week interval. Further improvement, although with decreasing distinctness may be objectified up to three weeks from the initial recording. ITA score differences (when negative) may also indicate a

relapse. This may be decisive, for example, if the question of regaining a driver's license requires expert opinion.

Schizophrenias

Due to the great heterogeneity among schizophrenic psychoses, both with respect to clinical appearance and clinical course, EEG seems to be comparably of lesser importance.

Nevertheless, it could be rewarding to individually follow the longitudinal course by ITA with respect to clinical parameters of process acuity. By means of objectifying pathophysiological process dynamics, therapeutic regimens could be placed upon a more rational basis than hitherto possible.

Psychosomatics

This is another domain of great relevance for public health care, where ITA might make an important contribution. From the generally accepted premise of the ("bio-psycho-social") mind-body unity, it follows that any disturbance of a function will not be restricted to the "target organ" of the respective disease, but also will affect other organ systems to a varying degrees, of course. Since the central nervous system functions as the integrating and controlling organ within the organismic hierarchy, principally any disease should be reflected in the EEG. This assumption appears as a necessary consequence of Hans Selye's time-honored General Adaptation Syndrome (GAS; see also the neuroendocrinic functional circuit of hypothalamus-hypophysis-suprarenal cortex). Nevertheless, Selye's proper intention leading him to GAS, namely to extend the one-sided medical specificity thinking by the non-disease-specific GAS, has never received mainstream thinking. Here we would contend that any non-specific evaluation of disease must be made in reference to the organizational levels of the CNS, as

reflected by EEG over time. **As it seems to us, there is no other way for diagnosing changes of the unspecific component of any disease than by means of objectively assessing the differences between the organizational levels of the EEG within the time-course.**

Acute Neurology of the CNS

There exist no means of objectifying spontaneous restitution or the effectiveness of therapeutic interventions in

traumatic brain injuries,
inflammatory, toxic or degenerative encephalopathies,
diffuse or circumscribed cerebral lesions of vascular, traumatic or neoplastic origin.

In all these cases it seems warranted to give ITA a chance.

Persistent Vegetative State (Coma Vigile)

Before ITA became available, not even repeated EEG recordings could provide any objective estimation of the long term prognosis in patients with Persisting Vegetative State. Though we ourselves did not test ITA within this context, we would hope that others may make use of ITA with this special indication.

From a theoretical perspective (see also early diagnosis of the neuropathological DAT-process) it seems quite plausible that the onset of any recuperative tendencies be detectable by EEG much earlier than clinically. It is obvious that any recuperative trend could be of major priority in motivating a nursing staff.

Neurologic Rehabilitation

With neurologic rehabilitation ITA should render information whether it is warranted to expect further restitution or not.

So one may get objective decision criteria for intensifying or completing rehabilitative measures.

Quantitative Topography of Focal lesions

A focal lesion (as well as changing extensions over time may be as presented as a quotient calculated from the absolute slow wave spectral power values of homologous regions of both hemispheres. Assuming a physiologic symmetry of slow frequencies such a left-right lateralization quotient could provide information of lateralized accentuations and thus structural damage. By nature as a two-dimensional time function of ongoing electro-cortical mass activity, the EEG will never reach the spatial resolution of neuroimaging techniques.

Nevertheless, it may be an undeniable addition to neuroimaging, rendering quantitative information about temporal longitudinal changes, especially useful for the diagnosis of Transitory Ischemic Attacks (TIAs), as characterized by the very fleetingness of any detectable brain correlates. Furthermore ITA is of advantage within the early acute phase of an vascular infarction, the initial perifocal edema or penumbra seldom allowing a sufficient structural differentiation.