

## **Significance and prediction value of the corpo-cranio-graphics (CCG) for occupational health care when work is done under risk of a fall from height**

The current field study about the practical experience during 20 years with the German act G-41 "Labour under the danger of falling hazards" was set up for evaluating the interrelation of neurootological equilibrium testing and the related occupational medical findings and assessments. It is centred around the method of cranio-corpo-graphy (CCG).

In 1968 cranio-corpo-graphy (CCG) was designed as a non-electronic, simple, objective and quantitative office recording procedure for head and body movements in vestibular spinal tests. Light tracings of head and shoulder movements were transformed through an instant camera into photographs, which look like a radar image of the head and shoulders, floating in space. This set of tests especially was developed for the West-German Berufsgenossenschaften (Labour Security Surveillance Boards) as a field test for occupational medical purposes in 1968. In 1983 it was officially introduced into an occupational medical act in West-Germany through the decree G-41 of the West-German Berufsgenossenschaften. By means of this study we are analysing the effects and consequences of the act G-41.

The vestibulo-spinal axis plays a vital role in the balance mechanisms of the human. For the decree G-41 two basic vestibular-spinal investigations were selected. The older Romberg Standing Test (1848) was meant to determine "unsteadiness" or "standing ataxia", however, it did not really permit quantification as such.

In 1938 Unterberger developed a gait test, based upon a procedure with stepping on the spot. He, for instance, observed, that patients, when suffering from an inner ear vertigo, stepping on the spot by all usually rotate to the side of their inner ear lesions. However, he did not quantify the test protocol until Fukuda (1959) added a spider net on the floor for marking the starting and the end position. The two tests are included into the Occupational Medical Act G-41 "Working under the danger of falling hazards."

The efficacy of both of the tests, i.e. Romberg's Standing Test, Unterberger/Fukuda's Stepping Test, has been evaluated in an occupational medical environment by evaluating 210 files from labourers at a center in Braunschweig and 568 files from another occupational medical center at Hanover. At Braunschweig the labourers have been investigated by the classical test procedures of Romberg and Unterberger/Fukuda with direct inspection of their test performances by the medical staff, however, without objective and quantitative recordings.

At Hanover all the 568 cases only were submitted to the Stepping Test. Their test results were recorded by means of a photo-optical cranio-corpo-graphy (CCG).

Additionally 243 investigations of a combined Stepping and Standing Test were recorded by means of a modern computer based recording technique (ultrasound-

computer-cranio-corporography). Another group of 500 cases, related to various types of pathologies, have been added from a neurootological data bank of the Neurootology laboratory of the University of Würzburg.

The G-41 field studies in Braunschweig, as well as in Hanover, show that the occupational medical specialists lean more upon other investigations from internal medicine and other medical fields, with which they were more familiar.

However, when evaluating the cases with respect to pathological signs, which indicate a removal from an occupation in a position with a danger of falling hazards, the equilibrium tests as such are most sensitive, i.e. CCG leading with 35% in front of the audiometric hearing threshold with 31% and visual acuity testing with 25% in defining rejection of labourers to G-41.

When analysing the differences between the Standing Test and the Stepping Test, it could be proved, that the Stepping Test is very much more sensitive than the Standing Test, i.e. 73,2% pathologies in stepping CCGs versus 28,8% pathologies in standing CCGs within the same sample of 500 neurootological cases. Thus the stepping CCG unveils 44,4% more disturbances, which would remain undiscovered, when only using the standing test.

Further it can be concluded from the study, that in the future a Stepping Test procedure with a recording of the test results should be applied regularly for G-41.

This, however, then must be guided and supported by special instruction courses for the occupational medical staff, investigating persons according to G-41, who are in danger to suffer from falling hazards. Also the more modern version of the CCG, i.e. the ultrasound computer CCG should be introduced.