

## Spectral Analysis of the Movement of the Center of Gravity in vertiginous and ataxic Patients

by  
K. TAGUCHI

Faculty of Medicine, Department of Otolaryngology,  
Shinsu University, Matsumoto

The frequency analysis of the movement of the center of gravity using the FOURIER technique has been reported by several authors, however, there had not been any detailed classification of the clinical results.

The present study deals with the pathognomonic signs found in the spectral patterns of the movement of the center of gravity during standing.

The static sensonograph constructed, using the strain gauge technique, was used to obtain, from a subject standing normally on the platform, a continuous record of the movement in the horizontal plane. The data was at the same time supplied to a data recorder, which separately stored the data of lateral and antero-posterior movement on the tape. The recorded data on the tape was fed into a digital computer for the spectral analysis using FOURIER technique.

The experiments were conducted on 71 normal adults and 102 vertiginous or ataxic patients. Each subject was placed on the platform of the sensonograph with feet together and asked to face straight ahead. Recording were made with the eyes closed and with them open. Each set of recordings was repeated three times in order to verify the reliability of the examination.

### Results

#### 1. Normal subjects

The peaks of the lateral component of frequency spectrum for the open eye trial were 0.3 to 0.6 Hz, while those of the closed eye trial were in the same frequency range as in the open eye trial, showing a larger amplitude. The antero-posterior component showed a peak of 0.3 to 0.5 Hz in the open eye trial and in the closed eye trial the larger peak shifted to a higher frequency above 0.5 Hz (fig. 1).

#### 2. Vertiginous or ataxic patients

Six basic patterns of the frequency spectra were obtained from the vertiginous and ataxic patients (fig. 2).

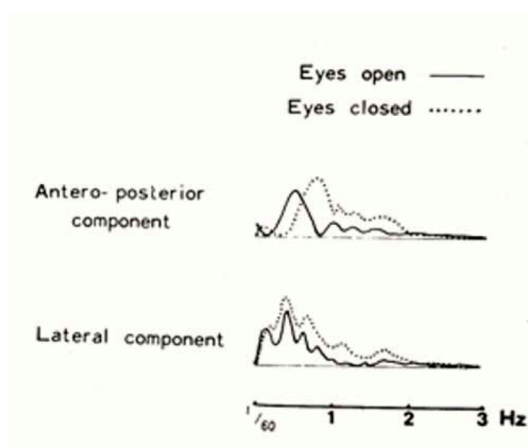


Figure 1

#### 1) Peripheral vestibular lesion

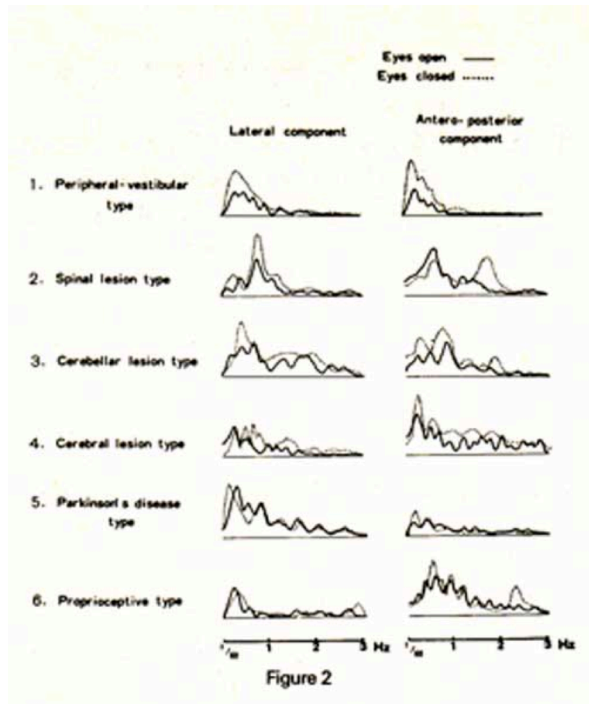
The frequency spectrum in the closed eye trial showed peak or amplitude augmentation at 0.2 to 0.3 Hz.

#### 2) Spinal lesion

The frequency pattern with the eyes closed closely resembled that with the eyes open except for the higher peaks in the closed eye test.

#### 3) Cerebellar lesion

The frequency spectra were of wide range extending to above 2 Hz with several high peaks in the antero-posterior component and one in the lateral component.



#### 4) Cerebral lesion

The basic potential in the movement of the center of gravity was relatively high throughout the spectrum (below 3 Hz).

#### 5) Parkinsonism

Very low frequency peak of the spectra was obtained.

#### 6) Proprioceptive hyperactivity

There was a characteristic pattern of the frequency spectra showing 2.0 to 2.5 Hz peaks in the lateral and/or antero-posterior component.

Reprints: K. TAGUCHI, M.D.  
 Department of Otolaryngology  
 Faculty of Medicine  
 Shinahu University  
 1-1 Asahi3-Chrome  
 Mataumoto - Japan