Clinical Aspect of Spontaneous Nystagmus

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Jansen (1898)[1] was the first to observe spontaneous nystagmus in inflammatory diseases of the inner ear and in intracranial complications of the middle ear infection such as meningitis and brain abscess in the temporal or occipital lobe. Since then numerous papers as to nystagmus were published by many authors in various fields, particularly ophtholmology, neurology and otoneurology.

The term nystagmus indicates an involuntary rhythmic movement of the eyes. The movements involved are generally of two types: 1. pendular nystagmus is characterized by an undulatory movement of equal speed and amplitude in each direction; 2. jerky nystagmus which demonstrates a biphasic rhythm wherein a slow movement in one direction is followed by a rapid saccadic return to the original position. The movements may be confined to one plane such as horizontal, vertical and oblique, or occur in more than one plane, for example rotary. The jerky nystagmus is identified by the direction of the fast component. Therefore in a right nystagmus, the fast component is to the right, the slow component to the left.

It is generally accepted by many authors that pendular nystagmus is always ocular, but the converse is not true, since ocular nystagmus may be jerking as well as pendular, and jerking nystagmus may be either labyrinthine, central or ocular. The jerking nystagmus due to vestibular in origin is differentiated between spontaneous and induced nystagmus. The former is generally present in the patients with disturbances of the vestibular organs, either peripheral or central.

According to Sir Duke-Elder[2] the fixation reflex tends to inhibit vestibular nystagmus since the two effects, optokinetic and vestibular, are opposed (Jung and Kornhuber[3], 1964); it follows that the latter accentuated in the dark (Ohm, 1931)[4] or when the lids are closed (Mowrer, 1937)[5], and it is most easily observed in dim illumination (Engelbrecht, 1926)[6], when the vision is obscured by blurring glasses (Bartels, 1922)[7] or in blind patients.

In order to reconsider the above mentioned phenomenon regarding

the spontaneous nystagmus proved by Jung et al. and others, we propose to analyze the cases with spontaneous nystagmus in this study. Our present analysis of clinical aspects is based on the study, made possible through the courtesy of our colleagues at Yamaguchi University Hospital of five cases examined in the course of the last few years.

In all cases of this study, spontaneous nystagmus was examined under the following conditions: 1. eyes opened; 2. eyes closed; 3. eyes opened in dark room; 4. Gaze a point forwards at 30 cm distance; 5. with Frenzel's glasses. As to equilibrium tests, Romberg' test and Mann's test were carried out, and caloric and rotatory responses were examined.

Case 1. A 27-years-old woman with Meniere's disease on the left ear. She developed the first attack of dizziness without vomiting lasting 30 minutes which followed hearing loss and tinnitus on the left ear. Four days later she again had attack of dizziness lasting half a day accompanied by vomiting. Since then she was still experiencing severe dizziness. On examination ear drums were clear. Her audiogram revealed 50 dB hearing loss on the left ear, perceptive type, notwithstanding normal hearing on the right ear. Romberg's and Mann's tests showed

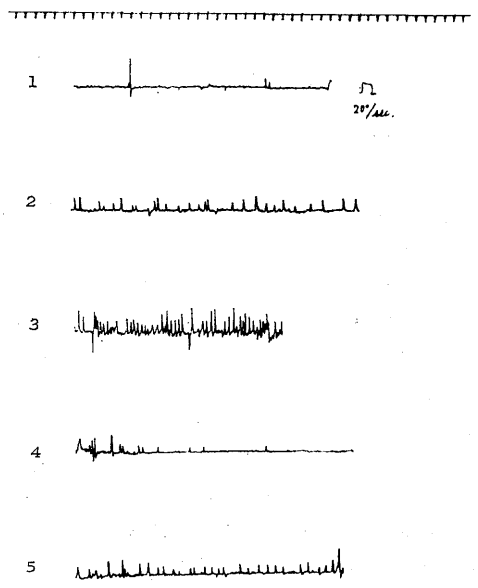

Fig. 1. A 27-year-old woman with Meniere's disease on the left side. Electronystagmography shows a right-beating spontaneous nystagmus horizontal in nature, under eyes closed(2.) largest quality of amplitude and frequency, and under gaze a point forwards at 30 cm distance (4.) smallest value of amplitude and frequency.

normal. Caloric tests proved abnormal responses (CP) on the left side and normal on the right side.

The recordings (Fig. 1) showed a right-beating spontaneous nystagmus, horizontal in nature. It is clearly seen in Fig. 1 that although directions of the spontaneous nystagmus recorded under different conditions are towards the right side without exception, the amplitude or frenquency of the spontaneous nystagmus shows various aspects.

As shown in Fig. 1, we found that 1. under eyes opened amplitude is coarse and frequency is medium, 2. under eyes closed amplitude is coarse and frequency is fast, 3. under eyes opened in dark room amplitude is medium and frequency is also medium, 4. under gaze a point forwards a 30 cm distance no nystagmus is present, and 5. under using Frenzel's glasses frequency and amplitude are medium.

From these aspects of amplitude and frequency of the spontaneous nystagmus in this case, we are able to consider that under eyes closed amplitude or frequency are the largest quality and under gaze a point forwards at 30 mm distance amplitude or frequency are the smallest value.

Case 2. A 22-year-old woman with vestibular neuritis on the left side. She developed common cold which was followed by the first attack of dizziness lasting two hours without vomiting. A week later she felt a sensation of off-balance when walking or standing which was getting increased by quickly head movement. She never complained of hearing loss or tinnitus on both ears. On examination eardrums were clear. Her audiogram showed normal. Equilibrium was normal in Romberg's test or Mann's test. Caloric responses presented canal paresis (CP) in the left side, notwithstanding normal in the right side. Rotatory test revealed hyponystagmus in the left vestibular organ.

The recordings (Fig. 2) showed a right-beating spontaneous nystagmus, horizontal and sometimes combined with rotatory in nature. We are able to find out in Fig. 2 that although the spontaneous nystagmus towards the right side are present under conditions of eyes closed and eyes opened in dark room (2. and 3.), under other condition such as eyes opened (1), gaze a point forwards at 30cm distance and using Frenzel's glasses no spontaneous nystagmus is present. Also we find out in Fig. 2 that amplitude is almost the same quality under both conditions-eyes closed and eyes opened in dark room, however, as to the frequency it is much faster under eyes closed than under eyes opened in dark room.

Case 3. A 18-year-old woman with vestibular neuritis on the left side

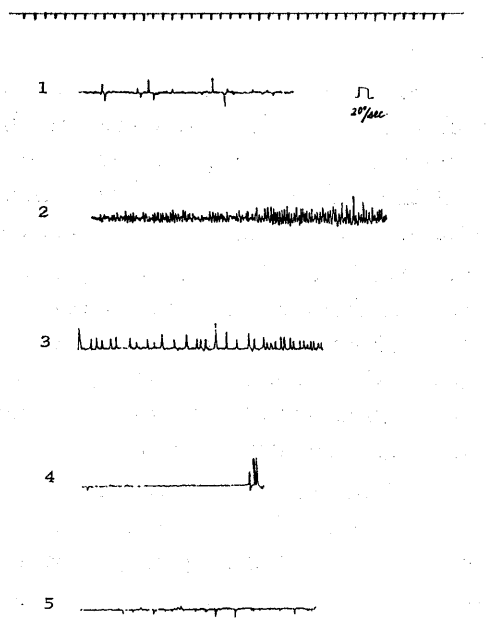

Fig. 2. A 22-year-old woman with vestibular neuritis on the left side. Electronystagmography shows a right-beating nystagmus horizontal or sometimes combined rotatory in nature under conditions of eyes closed and eyes opened in dark room only(2 and 3).

who developed the first attack of dizziness suddenly when taking a bus on the way home. She had a feeling of off-balance lasting for 3 days. This trouble was aggravated by all kinds of head movements. Ten days later she had again severe dizzness with vomiting lasting for one week. She never complained of disturbances of cochlear responses. The ear drum was clear on each side and audiograms showed normal hearing. Her equilibrium was disturbed. By Romberg's test and Mann's test her body fell towards the right side (opposite side) showing the vestibular responses on the left side involved. Caloric responses on the left ear revealed canal paresis (CP), notwithstanding normal on the right ear.

The recordings (Fig. 3) showed a right-beating spontaneous nystagmus, horizontal in nature. As shown in Fig. 3 we find out that although the spontaneous nystagmus towards the right side are present under conditins of eyes closed, eyes opened in dark room and using Frenzel's glasses (2,3 and 5), and under the conditions such as eyes opened and gaze a point forewards at 30 cm distance (1 and 4) no spontaneous nystagmus occurs. It is considered that amplitude of the spontaneous nystagmus in this case is more coarse excursions over 15° under eyes

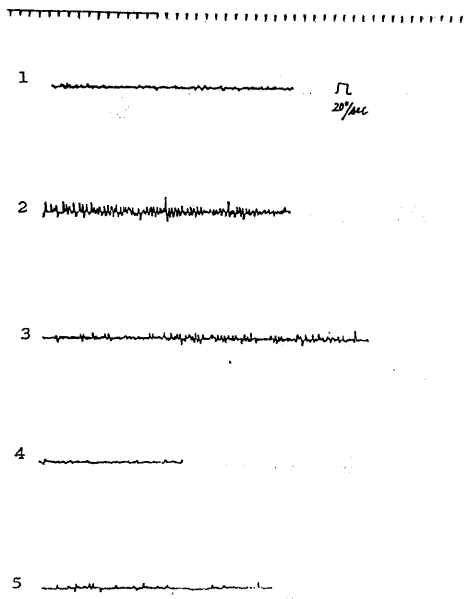

Fig. 3. A 18-year-old woman with vestibular neuritis on the left side. Electronystagmography showed a right-beating spontaneous nystagmus horizontal in nature under conditions of eyes closed, eyes opened in dark room and using Frenzel' glasses (2, 3 and 5), notwithstandingno spontaneous nystagmus under eyes opened or gaze a point forwards 30cm distance.

closed (2) than under conditions of eyes opened in dark room and using Frezel's glasses, and frequency is also faster under eyes closed (2) than under eyes opened in dark room or using Frenzel's glasses.

Case 4. A 63-year-old man with labyrinthine fistula on the left side. He had ear discharge on the left ear since his childhood. After a radical mastoidectomy he complained of severe dizziness with vomiting and on fistula test fistula symptom was proved. A fistula on the bony capsule of the lateral semicircular canal on the left side was identified by surgery. His audiogram showed deaf on the left side with normal on the right side. Equilibrium tests proved disturbed responses, that is, his body fell towards the right side (opposite side). Caloric stimulation had no response on the left side notwithstanding normal on the right side.

The recordings (Fig. 4) showed a right-beating spontaneous nystagmus, horizontal in nature. As shown in Fig. 4, it is clear that although the spontaneous nystagmus towards the right side are present under five different conditions, amplitude and frequency are different under each condition: 1. under eyes opened amplitude is fine and frequency is medium; 2. under eyes closed amplitude is coarse and

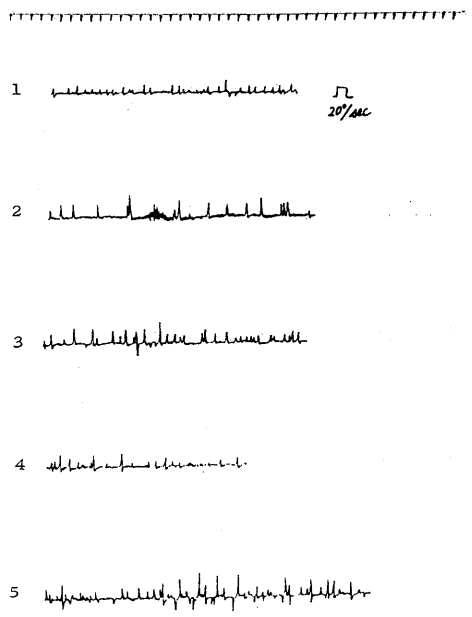

Fig. 4. A 63-year-old man with labyrinthine fistula on the left side. Electronystagmography showed a right-beating spontaneous nystagmus horizontal in nature under five different conditions, particularly presenting coarse amplitude under eyes closed(2), eyes opened in dark room(3) and using Frenzel's glasses (5).

frequency is slow; 3. under eyes opened in dark room amplitude is coarse and frequency is fast; 4. under gaze a point forewards at 30 cm distance amplitude is fine and frequency is slow; and 5. under using Frenzel's glasses amplitude is coarse and frequency is medium.

Case 5. A 50-year-old man with streptomycin poisoning. He was given injection of streptomycin for two years. After that he complained of tinnitus and hearing loss on the left ear. Three months later he had the first attack of dizziness when walking or standing. His audiogram showed 40 to 60 dB hearing loss on the left ear with normal on the right ear. Equilibrium tests revealed some disturbance falling towards the right side by Romberg's or Mann's tests. Caloric responses proved canal paresis on the left ear with normal on the right ear.

The recording (Fig. 5) showed a right-beating spontaneous nystagmus, horizontal in nature. It is considered in Fig. 5 that no spontaneous nystagmus is present under eyes opened (1) and under gaze a point forewards at 30 cm distance, and spontaneous nystagmus are found under eyes closed (2), eyes opened in dark room (3) and using Frenzel's glasses. We can see that the amplitude is more coarse under eyes opened

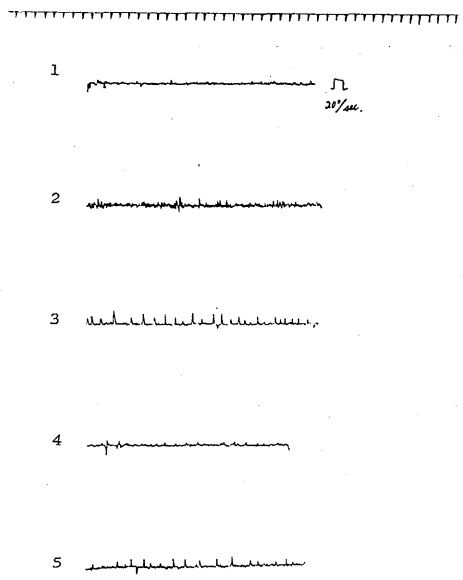

Fig. 5. A 50-year-old man with streptomycin poisoning. Electronystagmography showed a right-beating spontaneous nystagmus horizon in nature under three different conditions(2, 3 and 5).

in dark room than under eyes closed or using Frezel's glasses.

DISCCUSION

We come, finaly, to discuss clinical aspects of spontaneous nystagmus. As described in introduction of this paper the purpose of the present study is to reconsider how the fixation reflex inhibits spontaneous nystagmus.

As our starting point we shall take results from the present study. Table I gives us the aspects of spontaneous nystagmus under five different conditions in five cases of the present study. As shown in Table I under condition of eyes opened we found that no nystagmus is present in three of 5 cases, and fine amplitude and slow frequency of nystagmus are present in two. Under the condition of eyes closed we found spontaneous nystagmus in all five cases, and the amplitude is coarse in four and medium in one. As to the frequency, fast in three and medium in two of 5 cases were seen. Under the condition of eyes opened in dark room we found that in all five cases spontaneous nystagmus was recorded in electronystagmography and as to the amplitude coarse in three and medium in two, and as to the frequency medium in four and fast in one of five cases. Under the condition of gaze a point forewards at 30 cm

distance we found that no spontaneous nystagmus in four of 5 cases, and in only one case spontaneous nystagmus, presenting fine amplitude and slow frequency. Under the condition of using Frenzel' glasses we found that spontaneous nystagmus was recorded in four of 5 cases by electronystagmograpy, and as to the amplitude five in two and medium in two of 4 cases and as to the frequency slow in two and medium in two.

Judging from the above mentioned results of the present study, it seems to be considered that among five different conditions, under the conditions of eyes closed or eyes opened in dark room amplitude and frequency of the spontaneous nystagmus present the largest quality by recording of electronystagmography, and on the other hand under the conditions of eyes opened or gaze a point forewards at 30 cm distance amplitude and frequency present the smallest in value.

Also from the results of the present study, it must be kept in mind that although under the conditons of eyes closed or eyes opened in dark room spontaneous nystagmus is presnet and recorded by electronystagmography, under the eyes opened or gaze a point forewards no nystagmus is recorded because fixation reflex inhibits the spontaneous nystagmus under the latter conditions.

It is of importance to note that in order to record and observe exactly whether spontaneous nystagmus is present or not, the examinations of nystagmus should be carried out under the conditions of eyes closed or eyes opened in dark room, at least using Frenzel's glasses.

Table. 1. Aspects of spontaneous nystagmus

Case	1. Eyes opened	2. Eyes closed	3. Eyes opened in dark room	4. Gaze a point forewards 30 cm.	5. Using Frenzel glasses
1. Amplitude	fine	coarse	coarse	no nystagmus	fine
1. Frequency	slow	fast	medium		slow
2. Amplitude	no nystagmus	coarse	coarse	no nystagmus	no nystagmus
2. Frequency		fast	medium		
3. Amplitude	no nystagmus	coarse	medium	no nystagmus	fine
3. Frequency		fast	medium		slow
4. Amplitude	fine	coarse	coarse	fine	medium
4. Frequency	slow	medium	fast	slow	medium
5. Amplitude	no nystagmus	medium	medium	no nystagmus	medium
5. Frequency		medium	medium		medium

SUMMARY

Spontaneous nystagmus in five cases with labyrinthine disturbances were recorded by electronystagmography under five different conditions, such as 1. eyes opened, 2. eyes closed, 3. eyes opened in dark room, 4. gaze a point forewards at 30 cm distance, and 5. using Frenzel'glasses. It is concluded that under eyes closed (2) or eyes opened in dark room (3) amplitude and frequency of nystagmus present the largest quality, and under eyes opened (1) or gaze a point (4) no nystagmus present and, if present, amplitude and frequency of nystagmus is the smallest in value because of inhibition of fixation reflex.

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