Study of Elderly Patients with Vertigo using the Schellong Test and CMI

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ABSTRACT. We studied the involvement of autonomic function and psychogenesis in elderly patients with vertigo, using the Schellong test and CMI (Cornel Medical Index-Health Questionnaire) together with the equiliblium test. The rate of patients positive on the Schellong test was similar for the two groups aged 64 or under and aged 65 or over, but change in the pulse rate was more frequent in the younger group, while change in pulse pressure was more frequent in the older group. As for the kinds of disease, autonomic dysfunction and benign paroxysmal positional vertigo (BPPV) were predominant. With respect to the CMI, types III and IV were more common in the older group than in the younger group and were commonly observed in patients with BPPV. These results suggest that decreased autonomic reactivity and psychogenesis play an important role in vertigo in elderly patients.

Key words: elderly patients — vertigo — schellong test — CMI

In the aging society, the number of elderly patients with vertigo aged 65 or over has increased. Patients with vertigo due to autonomic imbalance or those with psychogenic vertigo due to neurosis have also increased in number, because of increased stress arising from complicated social situations.

To diagnose vertigo, we have adopted the Schellong test for autonomic examination as part of the equilibrium test, and the CMI (Cornel Medical Index-Health Questionnaire) and SDS (Self-Rating Depression Scale) for psychological examination. In this study, we examined the usefulness of the Schellong test and CMI in elderly patients with vertigo.

METHODS

The subjects of this study were 130 patients (55 males and 75 females) aged 65 or over who visited our hospital from Jan. 1986 through Jun. 1994, mainly complaining of vertigo, and who underwent an equilibrium test (pure tone audiogram, righting reflex test, deviation reaction test, caloric test, etc). Their average age was 70.5. The controls were 552 patients with vertigo aged 64 or under. Criteria for orthostatic dysregulation in children were used to judge the results of the Schellong test. Namely, patients were judged positive on this test, if they satisfied one of the following criteria: a narrow pulse pressure of 16 mmHg or more on the standing test, a decrease in systolic blood pressure of 21 mmHg or more, and an increase in the pulse rate of 21 beats or more per 1

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minute. Fukamachi's criteria[1] were used to judge the results of the CMI. Statistical analysis was performed by a X^2 test and $P < 0.05$ was considered to be significant.

RESULTS

Thirty-three (25.4%) of the 130 older patients and 158 (28.6%) of the 552 patients aged 64 or under were positive on the Schellong test. The rate of positive patients was slightly lower in the older group than in the younger group (There were no significant differences.), and higher in female patients (26.7%) than in male patients (23.6%) (There were no significant differences.). Female patients aged from 65 to 69 and male patients aged 70 or over had a higher rate of 30% or more (Fig 1).

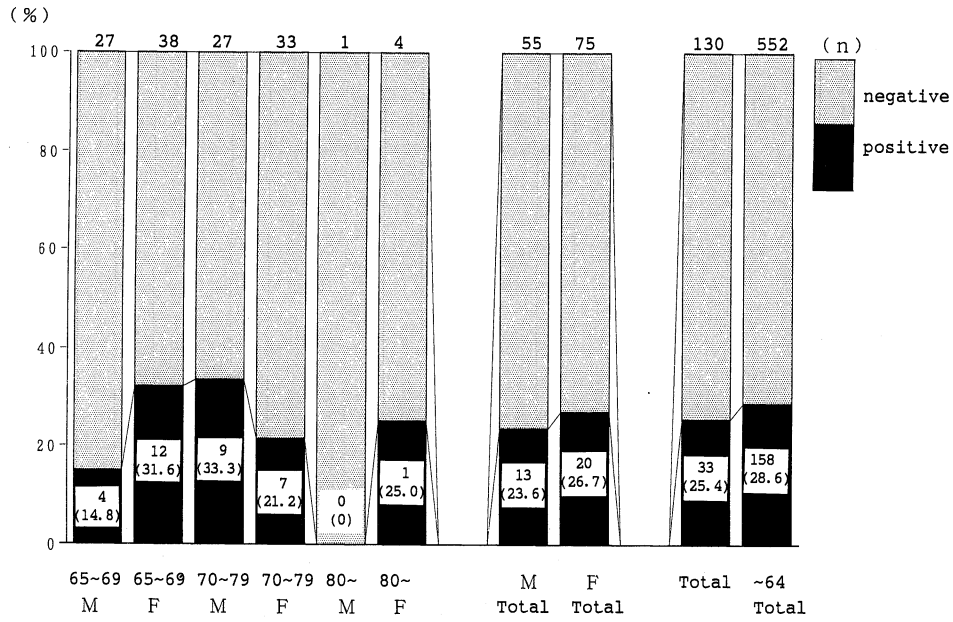

Fig 1. The positive rates on the Schellong test (age distinction)

Out of 158 positive patients aged 64 or under, 57 (36.1%) had a decrease in systolic blood pressure, 109 (69.0%) a narrow pulse pressure, and 40 (25.3%) an increase in the pulse rate, while out of 33 positive patients aged 65 or over, 16 (48.5%) had a decrease in systolic blood pressure, 28 (84.8%) a narrow pulse pressure, and 3 (9.1%) an increase in the pulse rate (There were no significant differences.). These results showed that the older patients more frequently had high diastolic blood pressure dysfunction (hypotonic type), which is common in children with orthostatic dysregulation (Table 1).

Regarding the kinds of disease, autonomic dysfunction was the most common, which an incidence of 50.0%. Benign paroxysmal positional vertigo (BPPV) was the second most common with an incidence of 33.3%. The incidences of Ménière's disease, peripheral vestibular disorder, and cerebral insufficiency were almost the same, being 20% (There were no significant differences.) (Fig 2).

TABLE 1. The Schellong test positive type distribution

	systolic blood pressure	pulse pressure	pulse rate
64 or under n=158	57 (36.1%)	109 (69.0%)	40 (25.3%)
65 or over n=33	16 (48.5%)	28 (84.8%)	3 (9.1%)

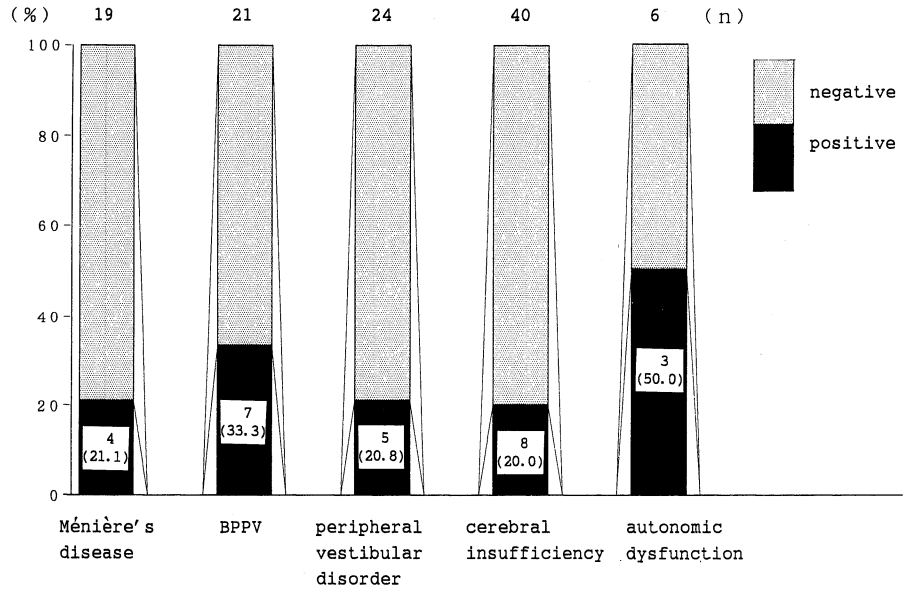

Fig 2. The positive rates on the Schellong test (disease distinction)

In a comparison of the results of the Schellong test and the righting reflex test, 26 (78.8%) of 33 patients positive on the Schellong test had a moderate to severe righting reflex disturbance. This rate was slightly higher than the 70 of 97 patients negative on the Schellong test (72.2%) (There were no significant differences.) (Table 2).

As for the CMI, 34 patients (26.2%) were of type I, 46 (35.3%) of type II, 40 (30.8%) of type III, and 10 (7.7%) of type IV. The combined rate of types

TABLE 2. The relation between the results of the Schellong test and the righting reflex

righting reflex / Schellong test	normal	slight disturbance	moderate disturbance	severe disturbance	not measured
positive n=33	1 (3.0%)	5 (15.2%)	21 (63.6%)	5 (15.2%)	1
negative n=97	5 (5.2%)	21 (21.6%)	55 (56.7%)	15 (15.5%)	1

III and IV patients was 38.5% which was higher than that for the younger group (33.9%) (There were no significant differences). Of particular importance, type IV was observed in 8 of 65 patients aged from 65 to 69 (12.3%), and this rate was higher than those for patients aged from 70 to 79 and aged 80 or over (Fig 3).

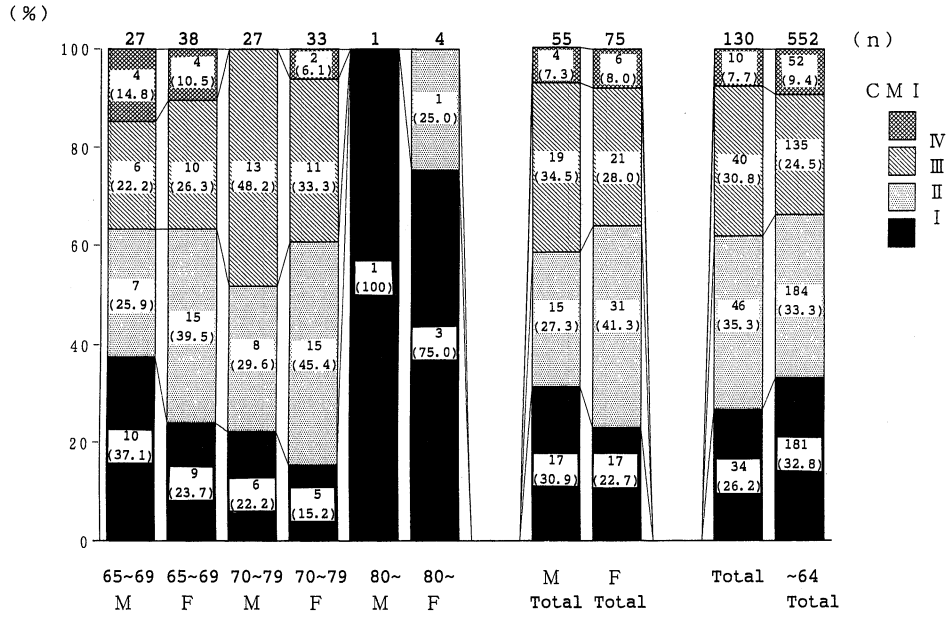

Fig 3. The CMI type distribution (age distinction)

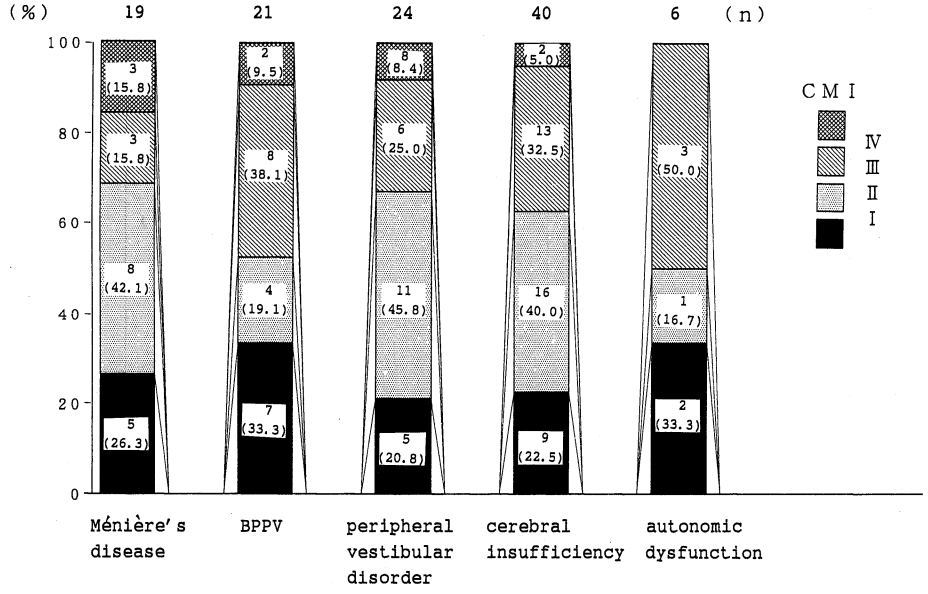

Fig 4. The CMI type distribution (disease distinction)

Ten of 21 patients with BPPV (47.6%) were of types III and IV. Three of six patients with autonomic dysfunction (50.0%) were of type III and 3 of 19 patients with Ménière's disease (15.8%) were of type IV. These diseases were more frequently observed in this study than other diseases (There were no significant differences) (Fig 4).

The CMI distribution of the patients positive on the Schellong test was 11 of type III (33.3%) and 3 of type IV (9.1%). The combined rate of 42.4% was higher than that for negative patients (37.1%) (There were no significant differences.) (Fig 5).

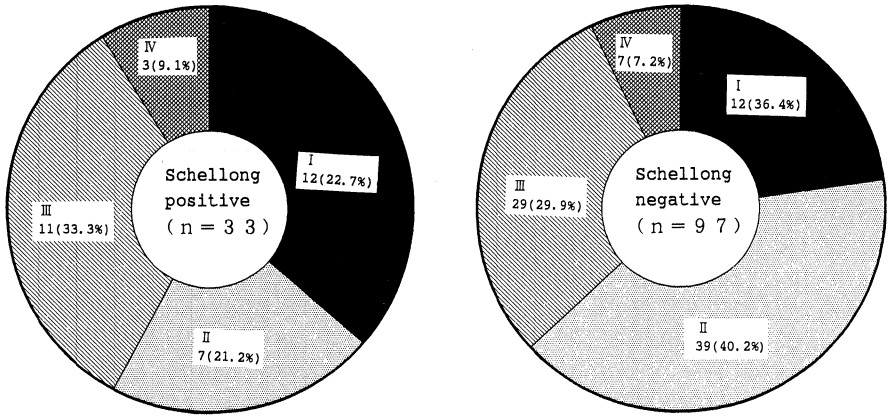

Fig 5. The CMI type distribution in patients positive on the Schellong test

The average number of "yes" answers to questions about physical subjective symptoms C, I and J in the CMI was 5.91 for patients positive on the Schellong test, which was larger than that for the negative patients (5.71). The number of "yes" answers to questions about psychic subjective symptoms M to R averaged 7.21 for patients positive on the Schellong test. This was smaller than the average (8.45) for patients negative on the Schellong test (There were significant differences. $P<0.05$) (Table 3).

TABLE 3. The relation between the results of the Schellong test and the incidence of 'yes' responses for each section of the CMI

CMI / schellong test	C. I. J.	M ~ R
positive	5.91	7.21
negative	5.71	8.45

DISCUSSION

There are two aspects to the relationship between vertigo and autonomic function and psychogenesis: changes in the autonomic function and psychogenesis as a result of vertigo and those as a cause of vertigo.[2] Vertigo has been mainly studied with regard to the latter. For example, in peripheral

vertigo-related diseases such as Ménière's disease, the parasympathetic function decreases and this leads to relative predominance of the sympathetic function. This tendency further increases at the time of attack, and it is impossible to control the changed blood pressure caused by various extrinsic and intrinsic factors, which results in circulatory failure in the brain and inner ear.[3]

On the other hand, in elderly patients with vertigo, who have increased in number, the cause of vertigo may be the decreased autonomic reactivity associated with aging and psychogenesis due to complicated social situations. The autonomic nervous system takes an important role in the autoregulation of cerebral circulation to keep cerebral blood flow constant against changes in blood pressure. Failure of autoregulation may cause central vertigo due to cerebral circulatory failure, and dysautoregulation of the vertebral-basilar system is a possible cause of peripheral vertigo.[4]

The usefulness of the Schellong test for examination of autonomic function is controversial. In this study, we used this test in the screening of patients with vertigo aged 65 or over and obtained a positive rate of 25.4%, which was slightly lower than the rate for patients aged 64 or under. Fujita *et al*[5] reported that there was no difference in the positive percent on the Schellong test between a senile group and a non-senile group. The positive rate for this test was high in not only patients with autonomic dysfunction and cerebral insufficiency but also in those with Ménière's disease thought to be caused by endolymphatic hydrops and those with BPPV whose pathogenesis has been recently suggested to cupulolithiasis[6] or canalolithiasis.[7] These findings suggest that microcirculatory failure in the inner ear due to the abnormal autonomic nerve may be involved in the pathogenesis or process of peripheral vertigo in elderly patients. As Ogino *et al*[2] reported, under a condition of decreased parasympathetic function, an excessive reaction of the body to stress enhances the intrinsic difference between the right and left vertebral blood flows resulting in the induction of vertigo. On the other hand, there has been a report that the positive reaction of patients with vertigo to the Schellong test is not directly related to the pathogenesis of vertigo but is related to the hyperactivity of the pressoreceptor reflex in the carotid sinus and aortic arch.[8] However, the abnormal dynamics of the autonomic nerve tend to increase with aging and abnormality in autonomic system is said to be more closely related to vertigo and imbalance as age increases. Nevertheless, in this study, there were many patients whose systolic blood pressure had decreased but the number of patients whose pulse rate had increased was few. This is related to a decrease in the sympathetic function due to aging. Therefore, the combined Schellong test, which is easily used even in elderly patients, may be very useful to evaluate the abnormal autonomic function underlying the pathogenesis of vertigo, and to treat it and to observe the clinical course.

In this study, types III and IV of the CMI indicating a tendency towards neurosis, were frequently observed in elderly patients with vertigo. Hisaki[9] reported that 57% of patients with Ménière's disease had a tendency towards neurosis represented by types III and IV. According to Yasuda's report,[10] the tendency towards neurosis was strong in patients with mild but refractory Ménière's disease. In this study, many patients (15.8%) with Ménière's disease were of type IV. As for Ménière's disease and its relation to autonomic dysfunction, psychogenesis may be both a cause of vertigo and a result. The

present study showed that a strong tendency toward neurosis was observed in patients with BPPV, the pathology of which is being clarified. These findings suggest that psychogenesis may be a result of vertigo rather than a cause. Study of the clinical course and outcome in each patient with BPPV required to definitely establish the relationship with psychogenesis. In patients positive on the Schellong test, the rate of types III and IV was high and the physical subjective symptoms C, I and J, which are autonomic symptoms were more frequent than psychic subjective symptoms M to R in the items of the CMI. Therefore, the combined Schellong test and CMI may be useful to examine the abnormal autonomic function which plays a role in the pathogenesis of vertigo in elderly patients, psychic changes due to vertigo, and the involvement of psychogenesis in refractory vertigo. In addition, the results of both tests can be used as an index of treatment with autonomic adjusters or antianxiety drugs.

SUMMARY

In this study, we examined the involvement of autonomic function and psychogenesis in elderly patients with vertigo, using the Schellong test and CMI. Decreased autonomic function and a tendency toward neurosis due to various kinds of stress is closely related to the pathogenesis of vertigo in elderly people but they are also symptoms caused by vertigo.

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