

prediction of this hypothesis is that differences in the values of these parameters will distinguish retrospectively between a group of fallers and a group of non-fallers. This we found to be the case. Our results strongly suggest that these hypotheses are tenable, since all three parameters were found to be significantly impaired (decrease in both minimal toe clearance and maximal sole inclination during swing, and larger lateral sway ratio) in patients with a history of falls. Although conventional gait parameters such as timed 'up and go' and gait speed are known to distinguish fallers as shown in Table 1, these general parameters do not suggest specific mechanisms as the possible direct causes of falls in the elderly. That is, we acknowledge the widely accepted correlation between walking speed and/or stride length and other kinematic variables, especially in the elderly.^{28,29} On the other hand, it is clear that a reduced velocity or stride length per se can not be the causal mechanism predisposing to falls. Thus, the clear covariance that would be obtained between, for example, the timed up and go measurements and our three kinematic parameters is unlikely to shed light on the actual mechanism involved in increased falling risk.

Toe clearance

The unevenness of a floor surface can vary from a few millimeters to more than 150 mm in height in the case

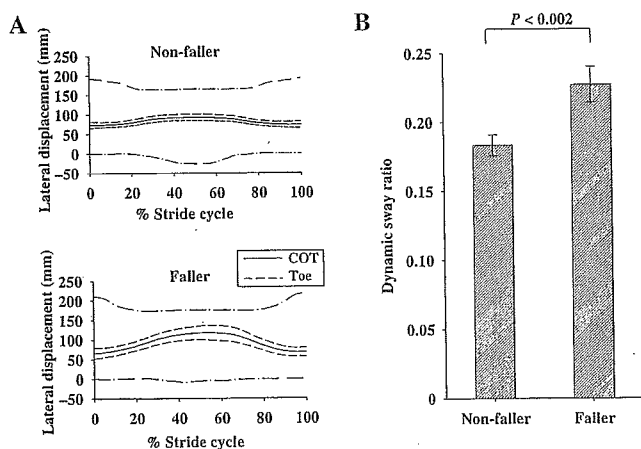


Figure 3 Dynamic trunk sway: (A) averaged trajectories of center of trunk (COT) position and toe markers in the top view during a stride cycle in a non-faller (upper) and a faller (lower). Standard deviations (SD) of COT are shown by dashed lines. Same individuals as in Figure 1. Sway ratio is defined by the maximal lateral excursion of the COT during the stride divided by the lateral separation of toe markers during the respective stance phases. The y coordinate is shifted such that zero is defined by the position of the right foot in mid-plant, i.e. at stride time zero with our convention. The lateral toe separation then corresponds to the lateral displacement, or y coordinate, of the left foot near 50% stride time. (B) Summary of lateral sway ratio in 31 non-fallers and 25 fallers. Vertical bar shows mean \pm SE (the difference is significant at $P < 0.002$).

of stair steps. Furthermore, obstacle contact can occur at any time during the swing phase of the gait cycle. In order to avoid tripping on such obstacles, strategies are required to minimize the risk of toe-obstacle or toe-floor contact. These include a simple increase in toe-obstacle clearance during the swing phase.³⁰⁻³² Therefore, any decline in toe-clearance from the floor increases the possibility of tripping over small, perhaps even unnoticed, obstacles. This is the motivation for our studying toe clearance differences in fallers and non-fallers.

Under normal circumstances, the toe-obstacle clearance is increased even when the obstacle is no more than a piece of tape on the floor.³³ This increase is seen in both leading limb and trailing limb. Although the heel or midsole can be the lowest point of the shoe when crossing the obstacle, they may carry less risk for a forward fall in case of contact than when the toe first contacts the obstacle, because heel or midsole contact is more likely to cause a simple stumble rather than a trip. For example, heel or midsole contact tends to cause ankle plantarflexion and possible forward sliding of the foot, which may aid recovery of balance, whereas no ankle rotation or sliding is likely to occur on toe contact. However, any decline in toe clearance must increase the probability of toe contact with obstacles, and hence increase the risk of falling. Our findings support these ideas, as shown by the significant differences between fallers and non-fallers shown in Figure 1. Our finding of toe clearance in non-fallers of around 1.5 cm is fully consistent with the value of 1.3 cm observed by Winter.³⁴

Dorsiflexion of the sole

Tripping on a flat floor is similar to, but different from, tripping due to toe-stubbing on obstacles. The transition from the swing phase to the stance phase of a stride is identified by heel-strike.³⁵ Tripping on a flat floor may be associated with failure of heel-strike to initiate the stance (i.e. failure to keep the toe higher than the heel as the foot is approaching the stance). It follows that a decline of the sole inclination just before stance phase may indicate an increased risk of tripping even on a flat floor. As above, this motivated us to study sole inclination kinematics, especially in the approach to the stance phase.

Biomechanically, the change of joint movement is a consequence of changes in the forces and torques at the joints. Muscle weakness in the lower limbs is associated with a diminished plantarflexion at the end of stance phase and with reduced swing phase dorsiflexion. Whipple *et al.* found that ankle dorsiflexion in fallers was the most affected among knee and ankle muscles.³⁶ Among joint functions in lower extremities, dorsiflexion in the ankle joint is one of the most important functions

for avoiding obstacles and is most susceptible to aging changes and stroke.^{22,36,37} These are consistent with our results showing a significantly smaller maximal sole inclination in fallers (Fig. 2B). To the extent that dorsiflexion of the foot is associated with both minimal toe clearance and with maximal sole angle during the swing phase, it is to be expected that both measures would be correlated; indeed this was the case. Moreover, since dorsiflexion is primarily associated with the tibia anterior muscle, it would suggest a possible common origin, such as tibia anterior muscle dysfunction, in the impairment of both these measures.

Dynamic trunk sway ratio

In addition to tripping, imbalance during ambulation has been reported as another common cause of falls in the elderly.³⁸ Describing these fall patterns, Sheldon commented on the many accidental falls that were apparently caused by impaired balance.¹⁹ The extent of lateral sway of the trunk (or more precisely, the body's center of mass) relative to the lateral separation of the foot plants is thus a natural candidate for sideways falls occasioned by impaired balance. This constitutes our motive in examining the differences in trunk sway in fallers and non-fallers, which, to the best of our knowledge, has not previously been investigated quantitatively. Note that we estimated the position of the body's center of mass by the geometric center of the four trunk markers. This undoubtedly leads to some error, but the small thoracic density is in part compensated by the mass of the head and neck, and so our estimates, though crude, are unlikely to be grossly in error. Note further that our definition of lateral trunk sway is fundamentally different from the more usual body sway assessed by motion of the body's center of mass while attempting to stand stationary on a force plate.²⁰ The latter is a static maneuver, in the locomotory sense, while our measurements of lateral trunk sway are dynamic; they are made during locomotory tasks, and thus may represent a more realistic assessment of the balance dysfunction that occurs during actual walking, and which therefore may be a more relevant measure of falling risk.

Our findings confirm these ideas. We found significantly larger dynamic trunk sway in fallers than non-fallers (Fig. 3). Imbalance of the whole body during gait may cause inappropriate movement of the lower extremities and, through potentially diminished reflexes together with muscle weakness, result in a fall. Although balance is known to have a strong relationship with muscle strength, the change in lateral dynamic sway with age is also due to a change in the ability to control movements that originate cortically. In our study, the faller group had a significantly higher prevalence of white matter hyperintensities of deep cerebral hemispheres in brain magnetic resonance imaging (data

not shown), similar to that previously described.³⁹ The relative contribution of cortical activity, spinal reflexes and muscle tone and strength to this kind of lateral fall is unknown, but is clearly important and bears further examination.

In this study, we focused on three specific kinematic parameters: toe clearance and maximal sole inclination during swing, and dynamic sway ratio. Other kinematic factors have also been postulated as risk factors for falling. Winter *et al.* documented that the increased velocity of the heel at the time of initial heel contact is expected to increase the likelihood of fall due to slipping.³⁴ Several investigators reported that increased gait instability, such as unsteadiness and inconsistency from one stride to next, is a strong risk factor for a future fall.^{23,40,41} Further studies are needed to clarify the relationship between our three risk factors and other potential risk factors.

Conclusions

All three of our kinematic measurements show discrimination between groups of elderly with and without a history of falls in the previous year. This supports our hypotheses that diminished toe clearance and sole inclination during swing, and increased lateral trunk sway are all potential risk factors for falls in the elderly. Since our kinematic measurements point to potential direct causes and mechanisms of falls, it may be possible to develop specific intervention strategies to reduce the risk of falls, tailored to each individual patient. The use of kinematic data such as we report here may facilitate the design of appropriate rehabilitation programs and exercise therapies. We do not envision these kinds of direct quantifiable measurements as replacements of the simpler clinical tests of gait such as the timed 'up and go' or gait speed tests; rather, we feel that they are complementary, and represent direct tests of hypotheses based on fundamental locomotory mechanisms that may predispose towards falls, and that these data may inform future experiments and tailoring of clinical therapies, especially in the geriatric population. The development of an easier device to measure the parameters might be another option for future study.

Acknowledgments

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Invited Review

Medical Treatments and Cares for Geriatric Syndrome: New Strategies Learned from Frail Elderly

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KUBO, H., NAKAYAMA, K., EBIHARA, S. and SASAKI, H. *Medical Treatments and Cares for Geriatric Syndrome: New Strategies Learned from Frail Elderly*. Tohoku J. Exp. Med., 2005, 205 (3), 205-214 — In Japan, there are 21 million older people above 65 years, and about 8% of them are frail elderly. Geriatrics is to study the frail elderly as to why they become frail elderly, and to treat patients properly or the remaining 92% older people not to become frail elderly. In order to promote health of the older people, geriatricians have to take deep insights for cares as well as medical treatments. With such a will, we find the way to prevent diseases in the older people. In this review, we describe medical treatments and cares for promoting successful aging. ——— geriatrics; dysphagia; pneumonia; depression; Alzheimer's disease; frail elderly
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While a single organ disease may cause various symptoms in young patients, in older patients complicated associations of multiple organ diseases generally cause a single symptom. The frequent problems in the frail elderly are eating problems, aspiration, pneumonia and associated brain disorders. Those geriatric syndromes could be explained with brain disorders. The elderly patients are most ill and most complex, and it is hard to treat the elderly properly. Nevertheless, recent studies make it possible to promote health of the older people.

Dysphagia

Eating generally takes longer in the frail elderly. We find that their reduced appetite may be caused by glucose-intolerance due to age-related impairment of the pre-cingulate gyrus (Hu et al.

2002). Furthermore, some of these patients are unable to swallow food properly. Following insertion of food into their mouths, they only chew it for a short while (He et al. 2004). These subjects might have dysfunction of the pre-insula region (Okamura et al. 2004). The question remains as to how we can treat them to recover their appetite? Aromatherapy with black pepper stimulates the pre-cingulate gyrus and pre-insula regions and improves glucose metabolism that results in the recovery of appetite. This is a method that is effective in some of the elderly to promote meal eating. Acupuncture to stimulate planters, lateral to the knees or medial to the calces is one strategy to promote swallowing, so that the residue in the mouth reduces and aspiration is prevented (Seki et al. 2003). Although it improves their appetite and swallowing function somewhat, these activi-

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ties remain problematic for some.

Aspiration occurs when some of food passes into trachea, instead of the esophagus. This does not improve by eating more food, since it is caused by impaired pharyngeal reflexes (swallowing reflex) for adequate swallowing (Nakazawa et al. 1993), and also impaired cough reflex in order to expel aspirated foreign bodies (Sekizawa et al. 1990). To contend with this phenomenon in pulmonary medicine, the Cough Referral Guideline was developed in the US. This guideline discusses the management of persistent or recurrent cough. However, the elderly often have difficulty coughing even when treated with a citrate aerosol that strongly induces coughing. However, the cough guidelines in the US do not relate at all to difficulty of coughing. In fact, difficulty of coughing is more likely to cause aspiration pneumonia that can result in death. The reason why they do not mention it is they do not take the elderly into consideration. The importance of this phenomenon must be considered, when caring for the elderly.

Aspiration

One cause of impairment of swallowing (Jin et al. 1994) and the cough reflex (Ujiie et al. 1993) that can cause aspiration is decreased production of substance P in the sensory nuclei of the vagus and glossopharyngeal nerves in the cervical ganglion (Sekizawa et al. 1997). Reduced substance P is caused by decreased production of dopamine in the cerebral basal ganglia that results from cerebrovascular disease in the cerebral deep cortex (Kobayashi et al. 1994; Jia et al. 1998). Therefore, one could say that aspiration caused by brain dysfunction (Yamaya et al. 2001a). Since reduced substance P leads to dysfunction of swallowing and the cough reflex, administration of substance P should resolve this problem (Nakagawa et al. 1995). One exogenous stimulant of substance P release is capsaicin, the key active component of red pepper (Ebihara et al. 1993). Oral administration of capsaicin permits these to be awake and improves swallowing and the cough reflex. Based on these data, we created a capsaicin lozenge with a hole in the center, so as

to prevent suffocation in case of aspiration. When the lozenge was administered before meal, swallowing and cough reflex were significantly improved. A combination of black pepper, to stimulate appetite, and the lozenge, may be even more effective.

When assisting the elderly to eat, allowing hot foods to cool down before they eat is not appropriate, because of the impaired swallow reflex. Hot or cool temperatures can accelerate generation of substance P and evokes the swallow and cough reflex (Watando et al. 2004a). This is one strategy to take care of the elderly.

Pneumonia

Patients with pneumonia often exhibit weakness of swallowing or decreased frequency of swallowing (Watando et al. 2004a). Therefore, administration of substance P should improve their dysphagia. Tanatril[®], an angiotensin-converting enzyme (ACE) inhibitor, has been shown to suppress degradation of substance P and elicits cough as side effect (Ebihara et al. 1996). We administered Tanatril[®] to people with impaired swallowing and cough reflex (Nakayama et al. 1998). The results showed that swallow function doubled to within the normal range. We compared between groups treated with and without Tanatril[®] and found that the group treated with Tanatril[®] showed improvement of swallowing and the cough reflex, and reduced pneumonia by one-third (Sekizawa et al. 1998). Additionally, since dopamine levels in these people are lower (Kobayashi et al. 1996), we used Symmetrel[®] to promote production of dopamine (Sekizawa et al. 1999). We compared between a group treated with Symmetrel[®] for three years and untreated controls. The results indicated that the group treated with Symmetrel[®] experienced decreased incidence of pneumonia by one-fifth (Nakagawa et al. 1999).

Although antibiotics are used clinically for pneumonia in the elderly, Tanatril[®] or Symmetrel[®] are also options as combination therapy with antibiotics or alone as monotherapy. The result of our work suggested that administration of Tanatril[®] or Symmetrel[®] reduced the use of antibiotics by half

(Kanda et al. 2004). Furthermore, the incidence of MRSA and death by pneumonia was also reduced. Consequently, the use of Tanatril® or Symmetrel® would likely also increase hospital profits. Although the elderly who have pneumonia are generally treated with antibiotics, if occult aspirations continue, they often lead to deterioration of pneumonia (Kikuchi et al. 1994). Therefore, pneumonia in the elderly has become known as intractable. Care for the prevention of occult aspiration (Nakagawa et al. 1997), as well as treatment with antibiotics reduced medical expenses by two-thirds.

Cerebral infarction

The reports regarding the effects of cholesterol are controversial (White et al. 2000). However, one such report found that elevation of cholesterol improved patients' resistance against infection, and resulted in improving their survival. One additional problem is the progression of arteriosclerosis by homocysteine (Matsui et al. 2001). Homocysteine is known in the pediatric genetic disease, homocysteinuria. In the elderly, elevated homocysteine levels are detected occasionally, and this is a concern as a risk factor for arteriosclerosis (Yamaya et al. 2001b). Vitamin B12 and folic acid are effective at reducing homocysteine levels. Vitamin B12 is found in fish, and folic acid is abundant in vegetables. Ingestion of these prophylactic diets leads to enhanced metabolism, which reduces the level of homocysteine resulting in lower incidence of arteriosclerosis (Sato et al. 2001). Nevertheless some of the elderly do not get sufficient vitamin B12 and folic acid from their diets. We compared between residents in the Onagawa-cho, Miyagi prefecture, i.e., a fishing village, and residents in the mountains area of the Kyusyu prefecture. The people in the fishing village in the Miyagi prefecture eat five times more fish than the people in the mountains. Moreover, the people in a fishing village ingest significantly more folic acid from seaweeds, including *konbu*, which decreases their homocysteine levels, thus preventing cerebral infarction. Therefore, fish and vegetables are indispensable in diets for the elderly.

Insomnia

Pneumonia develops in the night, because the swallowing reflex decreases in the elderly with cerebrovascular disease in the deep cerebral cortex (Wang et al. 1998), whereas healthy people do not change in their swallowing reflex, even during deep sleep (Pinto et al. 1994). Medical examinations of the brain indicated that one-half of those patients who are more than 65 years old have cerebrovascular diseases, and that they have decreased swallowing reflex, even when they are awake in the daytime (Nakagawa et al. 2000). Regarding the cough reflex as a protective function, patients frequently complain that persistent coughs disturb their sleep. However, this is not true; if people are truly sleeping deeply, they never cough (Zheng et al. 1997). This raises the following question: Does less sleep prevent aspiration pneumonia? We investigated how long elderly people sleep (Manabe et al. 2000). This may sound strange to some people, but to elucidate the universal tendencies of the elderly in their daily life is our guiding principle. Despite their frequent complaints of insomnia, these results showed that they sleep a tremendously long time, 6 hours in the night and 3.5 hours in the daytime, totaling 9.5 hours in a day. We generally prescribe sleeping pills for the elderly patients that constantly complain of insomnia. Although it is safer while they are taking weak hypnotics, if these patients have to switch to stronger ones, due to tolerance induced by chronic treatment, strong hypnotics have been demonstrated to suppress dopamine resulting in a decline of the swallowing reflex (Wada et al. 2001). Although these patients appreciate the effectiveness of the medicine to help their sleep, they are occasionally readmitted to the hospital because of aspiration pneumonia resulting in much more serious conditions. We found that the elderly taking hypnotics exhibit three times greater incidence of aspiration pneumonia.

Oral care

The causes of pneumonia are endogenic for the elderly and exogenic for youths. Since endogenic pneumonias are caused by aspiration of

bacteria from their mouth, cleaning their mouth must be one of the prophylaxes. We recommended brushing of the teeth for five minutes after each meal, which resulted in improvement of their swallowing (Yoshino et al. 2001) and cough reflexes (Watando et al. 2004b). Oral function is associated with 40% of the sensory and motor areas of the brain. This study demonstrated for the first time, that stimulation of their oral cavity led to stimulation of their brain, and consequently enhanced their general function.

We compared between groups with and without oral care and found that the group having oral care had a 40% lower incidence of aspiration pneumonia (Yoneyama et al. 1999). These patients were residents in facilities for the elderly. The elderly living in facilities usually present with more severe pneumonia and 80% of them eventually die (i.e., only 20% can survive). Osler (1898) declared 100 years ago "Pneumonia is friend of the elderly." This statement is true even today; no progress has been made. By contrast, daily oral care decreased the incidence of aspiration pneumonia and resulted in a reduction of mortality by 50% (Yoneyama et al. 2002). Oral care was generally proven to be superior to modern therapeutic antibiotics. The study suggested that elderly patients without teeth also required the same level of oral care as those with teeth.

Aspiration of gastric juice causes pneumonia that is three times greater in severity (Ohruai et al. 1997). How can the elderly prevent aspiration of gastric juice? Simply let them sit up after a meal, so that gravity prevents their aspirations, even when they have gastroesophageal reflux (Matsui et al. 2002). Our work indicated that this method reduced the incidence of aspiration pneumonia to one-third.

Feeding tube

The final decision is whether or not to feed them by mouth (Nakajoh et al. 2000). The elderly with incoherent responses for at least half a year or almost no appetite, are considered towards the end of their life in the US or European countries. In Japan, 10% of them are considered as dying, and 90% of them survive on average one more

year by alimentary therapy (Kosaka et al. 2000). When we asked the caregivers about forced alimentary, 60% of people answered that their patients accepted it because they did not have a choice (Kosaka et al. 2003). Meanwhile, 90% of the caregivers responded that they did not wish this to be performed for themselves or their parents. Japanese people are often easily influenced by the opinions of others. When the patients were told, "everybody said they do not want to do it," then forced alimentary therapy reduced by half. To discontinue nutrition immediately after the elderly become bedridden, as in the US, was not appropriate, but prolonging the life for a year or more, was not appropriate either. A compromise between both approaches has become generally accepted in Japan.

Immunity

The elderly commonly suffer from infections with unknown origin, such as pneumonia with *Mycobacterium mageritense*-intracellulare complex, because of their immunocompromised status, namely, deficiency of cellular immunity against bacterial infection (Ebihara and Sasaki 2002a). They are not exposed to bacteria every day, which reduces their immunologic competence. Some of the more active elderly people hurt themselves by minor injuries, which increases their immunity. Too much cleanliness decreases their immunity, as infection with a BCG vaccine enhances immunity (Ohruai et al. 2000). A PPD test is the best way to investigate cellular immunity (Nakayama et al. 2000). Elderly Japanese who are more than 65 years old should be positive for PPD, whereas if they are immunocompromised, it changes to negative. BCG vaccinated people who are positive for PPD, have elevated immunity that is prophylactic for pneumonia (Nakayama et al. 2002).

Influenza vaccination is routine for those who need in-home care or are residents in facilities (Fukushima et al. 1999a). Data from our own work contributed to establish this guideline (Fukushima et al. 1999b). Furthermore, *Pneumococcus* contributes to 30% of community-acquired pneumonia. *Pneumovax* against *Pneumococcus* is effective for those who need in-

home care as well. Only 1% of the elderly receive the vaccine in Japan, whereas, 58% of the elderly are given the vaccine in the US and European countries. The US government plans to raise this number to 90%. This plan should be implemented to the same degree in Japan as well.

Pulmonary disorders

Pulmonary functions including vital capacity, which generates energy for living, decrease with advancing age (Nakamura et al. 2002). The vital capacity declines until it becomes difficult to live, in 100 year-old people, even those who are non-smokers. All organs in their body decrease in function (Ohrui et al. 2004a). The Ministry of Health, Labour and Welfare in Japan has stated that statistically almost all of the 100 year-old people suffer from dementia. Cardiac or kidney functions also decline in these people. These elderly must accept their fate with resignation. Men seem more powerful than women, but yet they generally die seven years earlier than women. Only few men are able to survive longer. By contrast, if women have a long life, their physical performances generally appear lower.

The aforementioned statistics deal with non-smokers. Smokers have an even shorter life (Suzuki et al. 2001a). They never refrained from smoking. In addition to the damage they do to themselves directly, secondhand smoke is even more environmentally toxic. This is worrisome especially for the children. Thirty percent of children of tobacco smoking parents exhibit a tendency to develop asthma that is common worldwide. However, the results from our study demonstrated that the incidences of asthma are the same in the children of smoking or nonsmoking parents (Ohara et al. 2002). This is likely because 70% of Japanese smoker parents do not smoke at their home, and more than 99% of smoker parents do not smoke when they are with their children. Since they have learned that abstaining from smoking does not harm their children, they should quit smoking when they are with other children or even in public.

Leukotriene receptor antagonists are used as treatment for asthma. Although they are not so ef-

ficacious, they work occasionally during sleep (Kanda et al. 2000). This suggests that the allergic reaction and activity of cranial nerves in which allergic reactions take place are important. Both of these are indispensable to the development of an asthmatic attack. One of the conditions resulting in the most significant decrease in function of the cranial nerves is Alzheimer's disease. Asthma never manifests, if the cranial nerves, where the allergic reactions occur, exhibit lower activity, even if airway hypersensitivity or IgE allergy is evident (Ohrui et al. 2002). Thus, asthma does not develop in patients with Alzheimer's disease.

Alzheimer's disease

One of the objective diagnostic methods for Alzheimer's disease is to detect the presence of phosphorylated Tau in cerebrospinal fluid (CSF) that occurs in 85% (Itoh et al. 2001). Following objective diagnosis of Alzheimer's disease, how will it be possible to treat them? Oral care to stimulate their cognition might improve only one of 30 points in MMC score. Aricept is not so effective. One of the Chinese medicines, kamiuntanto[®], is effective, but is equivalent to Aricept[®]. Combinations of these medicines are slightly more effective, but generally last only half a year (Suzuki et al. 2001b). However, the ACE inhibitor, Coversyl[®], has been shown to decrease Alzheimer's disease to one-quarter (Ohrui et al. 2004b). Some of the ACE inhibitors penetrate the blood-brain barrier (BBB) and increase substance P that stimulates neutral endopeptidase (NEP), which degrades substance P (Ohrui et al. 2004c). However, this NEP has also been shown to resolve amyloid β -protein. Dr. Saido in Japan described the biochemical pathway by which NEP can catabolize amyloid β -protein in Nature Medicine in 2002 (Iwata et al. 2000). We found a prophylactic treatment for Alzheimer's disease on the basis of their data. We administered Coversyl[®] to the patients with Alzheimer's disease and decreased only one point in the MMC score after a year, whereas a Ca^{2+} -antagonist decreased it by four points (Ohrui et al. 2004d). Today, the newest treatment for Alzheimer's disease is vaccine therapy against amyloid β -protein.

However, 6% of these patients may develop nonbacterial meningitis (Hock et al. 2003). Therefore, we believe that other treatments, such as Coversyl[®], would be more efficacious.

However, Alzheimer's disease does not resolve by simply ceasing the decline in cognitive function. Behavior disorders are also to be noted in these patients, which occasionally manifest as violation or vocal abuse. Consequently, if Gramalil[®] or a major tranquilizer is prescribed, it can cause reduced dopamine levels that can result in aspiration or inability to walk. When we prescribed the Chinese medicine, Yokukansan[®], behavior disorder and activities of daily living (ADL) improved in these patients.

Depressive state

The elderly often suffer from depression, which may be due to social or familial problems (Shinkawa et al. 2002a). The depression causes the elderly to experience a common cold three times more frequently (Shinkawa et al. 2000). Decreased humoral as well as cellular immunity renders them susceptible to common colds or even cancers, as some data have demonstrated. Older patients with limited ADLs are most susceptible to the complications of influenza or common cold, resulting in severe dehydration, heart failure, or secondary bacterial pneumonia. Therefore, it is important to examine the condition of immunity in disabled older people according to their emotional state. We examined the emotional state of disabled older people with the Geriatric Depression Scale (GDS) and immune

conditions by antibody responses to influenza vaccination and delayed-type hypersensitivity (DTH) responses to tuberculin, as humoral and cellular immunoreactivities, respectively (Shinkawa et al. 2002b). The rates of positive antibody response and positive tuberculin response of depressed and nondepressed patients were compared. Our results showed that disabled, depressed older people have reduced reactivity in humoral and cellular immunity (Table 1). One cause of their depression is their ever-increasing medical expenses. Three children have to take care of one elderly parent. Some of the elderly feel that they do not want to bother their children or are embarrassed that they are living longer. However, to live longer means less medical expenses (Nakajoh et al. 1999). Furthermore, the historical and present-day working populations are almost the same - approximately 50% (Sasaki et al. 1996). We recommend these people to live longer and tell them "It is nothing to worry about."

We investigated the period for living since these elderly patients became bedridden (Kosaka et al. 1998). If they are bedridden after 80 years of age, they will pass away within a year. If this occurs after 90 years of age, they will pass away even sooner. If they are bedridden before 80 years of age, they will likely live for a couple of years. In-home care is most expensive. If you employ in-home caregivers for 12 hours a day, it would cost 10,000 yen. If you also need them during the night, an additional 12 hours will cost a total of 20,000 yen. This would cost 600,000

TABLE 1. *Depressive state and immunoreactivities*

Group	Increased Influenza antibody titers			Positive tuberculin response
	New Caledonia strain	Panama strain	Yamanashi strain	
Non-depressed (n = 18)	66.7%	55.6%	50.0%	88.9%
Depressed (n = 28)	14.3%	21.4%	17.9%	53.6%
Odds ratio	12.0 (95% CI 3.1-45.7)	4.6 (95% CI 1.3-16.1)	5.2 (95% CI 1.4-19.1)	6.9 (95% CI 1.5-31.8)

yen in a month. Moreover, if you add medical expenses to these costs, the total would be 1,000,000 yen in a month, and even 10,000,000 yen in a year. Thus, medical care staff and home caregivers should try to not confine these patients to their beds. It would be more prudent to encourage these patients to consult at the clinic and to start treatment at an earlier stage. The elderly pay only 20,000 yen a month on outpatient bills that would be much less expensive than that of in-home care. Avoiding being bedridden is essential in geriatric medicine.

Frail elderly

It is necessary to learn from the 8% who need in-home care, as to why they become confined to the bed, and to use this knowledge to treat a patient properly, to not become bedridden. This is a key principal in geriatric medicine and care. These data suggest that those persons who are devoted to other people have less serious disease occurrence. Those persons living longer could be called selected people (Katsumata et al. 1995; Kobayashi et al. 1997). The Japanese have the longest life span in the world that indicates having integrated an outstanding culture. In order to increase the average life span by one year, it takes five years (Sasaki et al. 1997). In the US, the life span is five years shorter than that in Japan, indicating that they are behind us by 5 times 5 or 25 years.

There are one million people who are confined to the bed in Japan, meanwhile there are no data representing people who are confined to the bed in the US. However, when we have been to the US to inspect, we have seen several people who are confined to the bed. The individuals requiring in-home care in the US are twice that in Japan, despite a lower number of the elderly in the US (Ebihara et al. 2002b). The Japanese society is affectionate to the elderly, while the American and European society would be cold to the elderly. If we develop a society which has a cold attitude to the elderly as in the US and European countries, the expenditures of elderly care insurance would double, requiring an additional 5.5 trillion yen. It is impossible to cover all

these costs. To cut down these expenditures for the elderly, they need to be given adequate status in the society (Ohrui et al. 2004e).

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REVIEW ARTICLE

Combinational Western and oriental medicine therapies for geriatric syndrome

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Oriental medicines often assist patients who cannot be treated with Western medicines. Although the exact mechanisms of oriental medicines are not known, their clinical usefulness has been proven in various diseases, including geriatric syndrome. In this review we explain progress in oriental medicine and how oriental medicines are effective in treating geriatric syndrome.

Keywords: acupuncture, dementia, geriatric syndrome, hachimi-jio-gan, Kampo medicine.

Introduction

Eating is the biggest problem for elderly people in need of care. Much effort is expended on eating. The existence of an appetite and the ability to eat in people in need of care, however, does not mean necessarily mean that their problems have been solved. They may wrongly swallow food not into the esophagus but into the trachea. This can lead to pneumonia and the act of eating is not completed. Although eating is the most basic activity in daily living, it is difficult for these handicapped elderly patients. Oriental medicines are often helpful to those patients who can not be treated using Western medicines. In this review, we explain the progress of oriental medicine and Western medicine for geriatric syndrome.

Eating

When examined for loss of appetite, people who have lost their appetite without any secondary reason (e.g. infection, dehydration etc) are found to have decreased glucose metabolism in the anterior cingulate gyrus located in the frontal lobe of the brain.¹ This area serves

as the appetite center (Fig. 1). Thus some elderly people do not eat because the function of the appetite center is reduced in the anterior cingulate gyrus. Even if they have an appetite and put food into the mouth, some elderly people cannot chew or swallow the food. Such people have decreased glucose metabolism in the anterior area of the islet.² People with reduced function in this area become unable to chew food at all. There is an aromatherapy treatment using black pepper (unpubl. data) that has people smell black pepper before meals and place the pepper on the table. Accordingly, the anterior cingulate gyrus, the appetite center, is stimulated to enhance appetite. When we bring black pepper to the nose, saliva spontaneously comes out in a large volume.

We also administered acupuncture to these people.³ When a needle was inserted to the Zusanli (lateral part of the knee) and Taixi (medial part of malleolus), the patient gained the ability to swallow various foods including water, fluid diet and solid food in a gulp, without swallowing problems.⁴

When exploring the reasons for swallowing problems, we once opened the mouth of a patient who was likely to contract pneumonia because of swallowing problems and found a 3-cm piece of pickled eggplant in his mouth. It occurred to us that this elderly person must have had greatly reduced sensitivity in his mouth and that he must not have swallowed in a gulp when his mouth was filled with food and saliva.⁵ We usually mix food with saliva and miscellaneous bacteria in our mouth and swallow the mixture, but such elderly people cannot do so.⁶ Normal people swallow at a rate of 18

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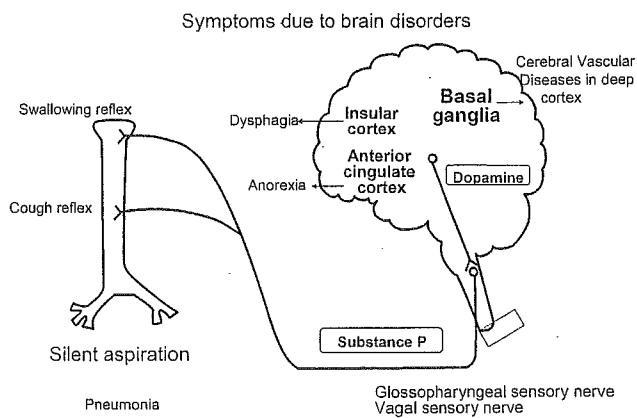


Figure 1 Mechanisms of geriatric syndromes such as anorexia, dysphagia and pneumonia (see text for explanation).

times per hour, but these elderly people have a very low swallowing reflex sensitivity.⁷

When food is wrongly swallowed into the trachea due to low swallowing reflex sensitivity, it must be spat out by coughing. It has been found that people presenting with pneumonia have an extremely low cough reflex sensitivity.⁸ Even when foreign matter enters the trachea, they cannot cough. Thus, foreign matter readily moves into the lungs and causes pneumonia. The guidelines on cough in Europe and North America detail how to stop coughing but describe nothing about how to induce it. The reason is that they do not see elderly people. In fact, elderly people frequently contract pneumonia because they do not cough, resulting in death on some occasions. People presenting with pneumonia have a low sensitivity to swallowing and cough reflexes.

A substance called substance P is produced at the cervical ganglia of sensory branches of the glossopharyngeal nerve and vagal nerve.⁹ Sensitivity of the swallowing and cough reflexes is lowered when the quantity of substance P is decreased because of retrograde transport.¹⁰ The reason for the reduction in the level of substance P is that its synthesis is decreased as the level of dopamine is lowered in the brain.¹¹ This is because multiple cerebral infarctions and cerebrovascular diseases occur at the deep cortex in the brain.^{12,13}

It has been found that what is called pneumonia is actually a disease of the brain.¹⁴⁻¹⁶ It follows that increasing the quantity of substance P helps prevent senile pneumonia. The quantity of substance P is most increased by capsaicin, a basic substance of capsicum.¹⁷ When something hot is put into the mouth, a senile person would open the eyes wide and have improved swallowing and cough reflexes.¹⁸ Thus we made troches mixed with capsaicin and instructed patients to suck them before meals. In this way they could take sufficient capsaicin, maintain normal swallowing and cough reflexes, and eat meals properly.¹⁹ There was a hole in

the troche to prevent it from causing asphyxia in the trachea. The worst practice is to offer barely warm food to elderly people in need of care based on the idea that hot or cold food is bad for them. It has been reported that elderly people, when taking very hot or very cold food, can eat meals without swallowing problems because substance P is adequately produced to maintain normal swallowing and cough reflexes.²⁰

Pneumonia

Imidapril hydrochloride is used as a drug to maintain swallowing and cough reflexes.²¹ Angiotensin-converting enzyme (ACE) inhibitors are used as antihypertensive drugs extensively around the world, but they also inhibit substance P catabolic enzyme, thereby preventing substance P from being decomposed. Although the quantity of secretion is small, substance P is not decomposed and remains as it is, so its level is increased. As a result, swallowing and cough reflexes are normally maintained.²² This is evidenced by the fact that coughing is a well-known adverse reaction of ACE inhibitors. The incidence of pneumonia can be reduced 3-fold by increasing the level of substance P with imidapril hydrochloride and thus maintaining swallowing and cough reflexes.²³ On the other hand, amantadine hydrochloride is used to increase the level of dopamine.²⁴ The incidence of pneumonia can be reduced 5-fold by using dopamine.²⁵ Pneumonia itself is conventionally treated with an antibiotic effective against the etiologic agent. When the antibiotic is used with imidapril hydrochloride and amantadine hydrochloride, the quantity required to cure pneumonia can be reduced by 50%.²⁶ In addition, the duration of hospitalization to treat pneumonia can be decreased by two-thirds, as is the case with medical costs. Furthermore, this concurrent use results in a limited number of methicillin-resistant *Staphylococcus aureus* (MRSA) cases and a lower level of mortality from pneumonia.²⁷ It has been said that pneumonia is intractable and recurrent in elderly people. The medical condition cannot be easily cured in this population because there is antagonism between the tendency of antibiotics to improve the condition and that of the swallowing problem to aggravate it. However, pneumonia can be cured in the same manner as in young people by using imidapril hydrochloride and/or amantadine hydrochloride concomitantly to prevent nonapparent swallowing problems in addition to antibiotics to treat the disease itself.

As imidapril hydrochloride is a hypotensive agent, it cannot be used in people with hypotension. Amantadine hydrochloride is difficult to use in some cases because this drug, promoting dopamine release, induces pseudopsia such as the vision of insects. A Kampo-drug called *Hange-koboku-to* is suitable for these people. This Kampo-drug potently produces substance P without

an antihypertensive effect or pseudopsia, resulting in improved swallowing and cough reflexes.²⁸⁻³⁰

Cerebral infarction results from cerebral arteriosclerosis. However, cholesterol is unrelated to cerebral infarction and does not pose any problems with this medical condition.³¹ Rather, low cholesterol, an indication of low resistance, is said to even cause elderly people to die earlier. There is a theory that high cholesterol in this population is a parameter of longevity. We have to ingest homocysteine-lowering substances from food. The metabolism of homocysteine is promoted by taking vitamin B12 and folic acid from food to decrease the homocysteine level and thus prevent cerebral arteriosclerosis. Fish and vegetables are rich in vitamin B12 and folic acid, respectively.³² The level of homocysteine is generally high in elderly people because they ingest limited amounts of fish and vegetables in many cases. Homocysteine levels are considerably lower in people in fishing towns than in people in areas that are far from the sea. People in fishing towns eat five times as much fish as other people and take folic acid from tangle weeds and other seaweeds. People who eat a lot of fish and vegetables have low homocysteine levels because they take in large quantities of vitamin B12 and folic acid. As a result, they rarely suffer cerebral infarction.³³ Thus fish and vegetables are important for elderly people to prevent pneumonia.

Hypnotics

Pneumonia is induced at night, as the swallowing reflex is lower during sleeping than in the daytime in people with cerebrovascular diseases.³⁴ Many elderly people complain about being unable to sleep because of coughing, but this is wrong. If severe coughing occurs, this condition would stop once they fall fast asleep.³⁵ They complain about coughing because they have trouble falling asleep or wake up at dawn due to this condition, but they do not cough during sleep.³⁶ When we researched the sleeping time in elderly people, contrary to our expectation, they were found to sleep for a surprisingly long time: 9.5 h minimum daily, 6 h at night and 3.5 h during day.³⁷ In spite of these results, a hypnotic is sometimes prescribed for people with sleeping difficulties. A prescription of mild hypnotics will not present any specific problems. If the patient says that it does not work, however, the doctor could easily prescribe potent hypnotics, which are found to be dopamine inhibitors. Thus dopamine is inhibited which reduces swallowing reflex sensitivity. Although the patient thanks the doctor for prescribing the potent hypnotic, he/she can be hospitalized with pneumonia within 1 week, resulting in more time and work.³⁸ Hypnotics can be used in young people without any problems. The opposite should be considered in elderly people complaining of an inability to sleep.

When young people complain of coughing, antitussives can be used as much as necessary without any problems. When elderly people talk about a coughing problem, however, it is very likely that foreign matter and saliva are moved by swallowing into the trachea to induce a number of incomplete coughs. In that case, we have to come up with some measures to help them cough completely.³⁹ This is opposite to the action taken in young people and should be considered here as well.

Oral stimulation

It is naturally necessary to keep the oral cavity clean because oral bacteria and saliva are wrongly, and unconsciously, swallowed into the trachea, causing pneumonia. The swallowing reflex can be improved by cleaning the oral cavity with a toothbrush for 5 min after meals.^{40,41} The mouth accounts for the largest area of the brain, 40% of the sensory and motor cortexes. We have demonstrated for the first time that stimulation of the mouth is reflexively returned to the whole body. The swallowing and cough reflexes were successfully improved by oral care to reduce the incidence of pneumonia by 40%.⁴² It has been reported that only 20% of pneumonia patients could be saved despite treatment with antibiotics in a facility for the aged. A doctor named Osler said 100 years ago that pneumonia was a friend of elderly people, but treatment of pneumonia has not advanced at all over the past 100 years.⁴³ However, the mortality of pneumonia could be reduced by half by oral care in these elderly people.⁴⁴ It is noteworthy that everyday life care, such as oral care, has been found to be far superior to modern antibiotics in reducing mortality from pneumonia. This seems to be one example of the fact that medical care and nursing care exert almost the same effect on the maintenance of health in elderly people. When gastric juice is nonapparently wrongly swallowed, the severity of pneumonia is increased 3-fold.⁴⁵ Gastric juice is hyperosmotic and includes gastric acid and pepsin, and gastroesophageal reflux occurs in some cases.⁴⁶ Allowing elderly people to sit up for 2 h after meals can successfully reduce the incidence of pneumonia can by 3-fold.⁴⁷

Terminal stage

When a patient gets weaker and weaker for 6 months; when they do not willingly eat meals any more;⁴⁸ when people talk to them and they do not return a meaningful answer, in Europe and North America, people around them give up on them. In Japan, 10% of people make the same judgment, but the remaining 90% say, 'Please do something to allow them to live longer.' And they will live for another year thereafter.⁴⁹ When we ask caregivers, 'What do you think of tubal feeding or forced nutrition?', 60% of them answer like this: 'It cannot be

helped.' 'We have no choice but to do this.' In contrast, to the question 'When you or your family members fall in the same condition, do you want us to try hard to do things such as tubal feeding to allow yourself or them to live longer?', 90% of the caregivers answer like this: 'Please do not do that.'⁵⁰ We think it wrong to stop care at once as in the USA. However, it is also wrong to allow such a person to live for a long period. We are now reaching a middle point somewhere between the two extremes.

Circumstances

Elderly people frequently contract infections because their resistance to bacteria is weak.⁵¹ This is because they are not exposed to bacteria in everyday life. Lively elderly people with sun-tanned faces usually live in an environment in which they are exposed to not-too-dangerous bacteria. They possess sufficient cellular immunity that they can fight bacteria even when suffering from serious pneumonia. People of this kind will be all right. Some specialists on infections recommend a clean environment, saying, 'Do not do this. Do not do that, either. Wash your hands.' My view is, however, that these instructions are the same as saying, 'You will die of pneumonia soon.' Elderly people have to live in as dirty an environment as possible. When we enter the room saying hello, it smells of urine. People living in a place of this kind will be all right. As proof of the above, all elderly people aged 65 years or above must have contracted tuberculosis at least once.⁵² Tuberculin reaction is the easiest way to examine cellular immunity.⁵³ Negative tuberculin reactions represent low cellular immunity. When BCG vaccine, or tubercle bacillus, is administered to people with a negative tuberculin reaction, their cellular immunity turns active, and those who tested positive for tuberculin reaction do not contract pneumonia.⁵⁴ This fact indicates how important it is to live in a dirty environment. It has been insisted for about 3 years that influenza vaccine should be administered to elderly people in need of care.^{55,56} There is a vaccine named pneumococcus vaccine against *Streptococcus pneumoniae*, which accounts for 30% of etiologic agents of community-acquired pneumonia. This vaccine is administered to 58% of elderly people in North America, while it is used in only 1% of the aged in Japan. It was demonstrated for the first time that pneumococcus vaccine is clearly effective in elderly people in need of care. Seihai-to has been reported to be effective against oxygen radicals that are produced by chemical pneumonia due to miswallowing gastric juice.⁵⁷

Organ failure

Pulmonary vital capacity is an index of the vitality for living. This value decreases over age and reaches at

about 100 years of age the point where it is impossible to live any more.⁵⁸ It is thus shown that a person will die at 100 years of age without fail however, carefully may he/she pay attention to health and avoiding smoking. This also holds true for other organs. With the brain, for example, all Japanese people will contract dementia at 90–100 years of age. All organs, including the heart and kidneys, will die at 100 years of age. The above mainly applies to elderly women. Strange as may it sound, elderly men appear healthier than women of the same age. In fact, however, men die 7 years earlier than women. This indicates how miserable this society is for men. Men easily die from minor causes such as a fall as they get very old. Thus only selected men will survive, and this is the reason for the fact that men look healthier than women of the same age.⁵⁹ This is the way it is when we see health-related average values because women live longer even if they get senile. Some may have the illusion that this is a man-centered society. But this is not true. Just take a look back upon history. A man had the illusionary idea that he controlled the world, but soon another man killed him to take over the position. In contrast, women live with some difficulties but surround men. Actually, women control men in this society. Thus we would be able to rationally explain differences in health state between men and women.

In addition, a smoker will die much earlier quite naturally. Despite endless cautions against smoking, people continue to smoke. Smokers themselves have to face the results because they asked for them. However, smoking affects people around the smoker. Children are most affected by smoking. Smokers' children have bronchial asthma 30% more frequently than non-smokers' children. When we recently investigated, however, the incidence of bronchial asthma was the same between smokers' children and non-smokers' children. Why did this happen? It is because 70% of recent smokers stop smoking at home and 99% of them stop smoking in front of their own children, but they smoke in front of others' children.⁶⁰ Now that smoking is found to affect all children, we should not smoke in front of others' children or in public. This is a good chance to further promote non-smoking.⁶¹

Dementia

Dementia is a problem of elderly people in need of care. It has been reported that it is possible to objectively diagnose early dementia at a probability of 85% 2 years in advance by examining phosphorylated tau in cerebrospinal fluid.⁶² A drug named donepezil hydrochloride is found to be virtually ineffective. On the other hand, there is a Kampo-drug called Kami-untan-to.⁶³ Donepezil hydrochloride inhibits acetylcholine catabolic enzyme, while Kami-untan-to accelerates synthesis of acetylcholine.^{64,65} Kami-untan-to improves

the Mini-Mental State Examination MMSE value by only 1 point over 6 months, although it initially produces some effects. So it can be said that this Kampo-drug is also almost ineffective. Concomitant use of the two drugs can create relatively better effects. We examined 4000 elderly people for 8 years using perindopril erbumine, another ACE inhibitor passing through the blood-brain barrier. As a result, the incidence of Alzheimer's disease was successfully reduced 4-fold in relation to that obtained with other calcium antagonists.⁶⁶ Thus the level of substance P in the brain can be increased, without decomposition, by using an ACE inhibitor crossing the blood-brain barrier.⁶⁷ There is a substance called neutral endopeptidase (NEP), another substance P catabolic enzyme. As the substance P level is raised, the NEP level is also increased. Accordingly, the incidence of Alzheimer's disease is decreased because NEP is a beta-amyloid catabolic enzyme.⁶⁸ When the level of activity is low in everyday life, the substance P level is low not only in the periphery, readily causing pneumonia, but also in the brain, resulting in a decrease in the level of NEP. Thus elderly people whose activity level is low in everyday life are more likely to present with Alzheimer's disease. The MMSE value of Alzheimer patients decreases by about 4 points (30 points maximum) in 1 year. The extent of decrease can be successfully reduced to within 1 point by using perindopril erbumine.⁶⁹ Vaccine therapy for beta-amyloid protein has been attempted as the most advanced treatment. Perindopril erbumine produces almost the same effect as the vaccine therapy. However, the vaccine therapy was found to cause non-bacterial meningitis in 6% of patients.⁷⁰ Although a new vaccine therapy for non-bacterial meningitis may be developed in 10–20 years from now, perindopril erbumine is currently the most advanced and most effective in the world as far as we know. It has been reported that a Kampo-drug named Hachimi-jio-gan is about twice as effective as donepezil hydrochloride in enhancing cognitive function.^{71,72}

However, abnormal behavior is a larger problem than cognitive function in patients with dementia. In terms of nursing care, mentally abnormal behavior is more important than becoming senile. Antipsychotic drugs are conventionally used to cope with abnormal behavior. For example, tiapride hydrochloride, etc. is used to keep the patient quiet. However, tiapride hydrochloride is a dopamine inhibitor. So patients treated with this psychotropic drug are likely to contract pneumonia because their swallowing reflex sensitivity is lowered. In psychiatric wards, inpatients are very quiet, but they suffer from pneumonia and die one after another. In addition, they have a tendency to fall. There is an epoch-making Kampo-drug, Yoku-kan-san, which does not inhibit activity, but rather increases activities of daily living (ADL), and suppresses mentally abnormal

behavior.⁷³ We expect this Kampo-drug to radically change the use of psychotropic drugs.

Falls

According to our analysis, the tip of the faller's foot is raised 1 cm or less from the floor, compared with about 2 cm for those who do not fall.⁷⁴ They trip over even the edge of a tatami mat raised by 0.5 mm. When acupuncture is performed at points of Taixi and Shenshu, it makes it possible for the person to walk steadily.⁷⁵ In muscular dystrophy, muscle blood vessels do not dilate due to a defective dystrophin gene. Accordingly, muscular dystrophy patients rise only shakily because their legs are in a numb-like state. When acupuncture is administered to these patients, however, they easily go out smiling from the outpatient clinic on foot (unpubl. data). The mechanism has not clearly been explained, but it is conceivable, though without any evidence, that acupuncture may increase the level of substance P, which is related to pain stimulus, to allow muscle blood vessels to dilate, so the patients can walk smoothly. It has been found, as mentioned above, that oriental medicine is a highly advanced medicine that starts from the point where Western medicine gives up. However, there are acupuncture-related accidents, including pneumothorax due to a needle left in the body and needle-insertion into the spleen, to which we should pay attention.⁷⁶

Miscellaneous lung diseases

Some people spend about ¥300 000 a month taking a large quantity of Agaricus (*Agaricus blazei* Murill) – an indication of how prevalent health consciousness has become in our society. However, a blastoid transformation reaction occurs and bronchitis obliterans with organizing pneumonia develops in some people after taking Agaricus (unpubl. data). So it would be better not to excessively use supplements but to take only reliable ones.

A method for treating idiopathic pulmonary fibrosis (IPF) has not yet been discovered. IPF is a disease of blood vessels as well. The prognosis of IPF could be improved 3-fold by using antiplatelet drugs and anticoagulant therapy.⁷⁷ Accordingly, recent inpatients with IPF will not die any more at our hospital. A Kampo-drug called Juzen-taiho-to has been reported to be effective against lung cancer.⁷⁸ Lung cancer is a solid cancer with a hypoxic state inside it. In this state, the disease becomes very resistant to chemotherapy. To solve this problem, we attempted to alleviate the hypoxic state by producing NO with isosorbide dinitrate and thus dilating the main blood vessels of the solid cancer and successfully improved the effect of chemotherapy 3-fold.⁷⁹ Lung cancer can thus be cured as satisfactorily as pneumonia at

our hospital. This treatment method is promising although does not necessarily work in all patients.

Depressive state

Elderly people often feel depressed.⁸⁰ Confucius once said that people become mentally more stable as they get older. This saying is his expectation. In fact, our research showed that our patients over 60 years of age feel very depressed. Depression does not seem to be good because it decreases levels of cellular immunity and humoral immunity making subjects more likely to catch cold.^{81,82} A Kampo-drug called Nyoshin-san can improve depression in these people (unpubl. data). Reasons for depression include not only personal problems (e.g. 'My daughter-in-law is hard on me') but also social problems (e.g. 'High medical costs for the aged is a big problem, three children supporting one elderly person').⁸³ On hearing these kind of comments, elderly people become depressed saying to themselves, 'I do not want to be a burden on my children and I do not know what to do'.⁸⁴ When we compared life-long medical costs between longevity and non-longevity groups, however, the costs were found to be lower in the former than in the latter because those who died earlier tended to be sick and went to hospital many times.⁸⁵ This indicates that we should try hard to help elderly people live longer not because we are tender-hearted but because longevity would bring financial benefits to Japan. When becoming bedridden at over 80 years of age, even a woman will die within 1 year but when becoming bedridden before 80 years of age, it takes as long as 2 or 3 years.⁸⁶ If we ask a caregiver to work for 12 h during the day, it will cost ¥10 000 at present. If we ask the caregiver to additionally work for 12 h at night as well, it will cost ¥20 000 a day. That is ¥600 000 a month and increases to ¥1 million when medical costs are included. That is ¥10 million a year and ¥20 million over 2 years. What we are trying to say here is that all involved with the elderly, medical professionals and caregivers, should try very hard not to produce bedridden people at any cost. The answer is to visit an outpatient clinic earlier. Some may say that recent hospitals look like salons full of the aged, but medical costs for one elderly person are only ¥20 000 a month, which is far less than ¥1 million. Hospitals should prescribe a large amount of drugs, and elderly people should take the drugs and try very hard not to become bedridden at any cost.

Bedridden elderly

Elderly people in need of care accounts for only 8% of the aged. Closely observe elderly people requiring long-term care to understand the factors responsible and take preventive measures in the other 92% of elderly people who would require care in the future. This is what geri-

atric medicine or nursing care is all about.⁸⁷ The point is how they spend their time after retirement. People who do anything to help other people would be free of major diseases.⁸⁸ This shows how important it is to think actively.^{89,90} There are one million bedridden elderly people in Japan. In contrast, there are no 'bedridden elderly people' in Europe and North America, because those who might otherwise be categorised as such are forced to get up in the morning and to sit during the day. However, the elderly population is larger in Japan than in Europe and North America, while the number of elderly people in need of care in Japan is less than half of that in Europe and North America.⁹¹ Western society would be rather cool towards the aged. After all, Japanese society is relatively gentle to the elderly. If Japanese society becomes indifferent to the aged as in Europe and North America, the number of elderly people in need of care would be twice as much as at present, as would the public nursing care insurance premium. To reduce the cost for the elderly to any extent, it is very important to create a society tender towards the aged, in which they are properly positioned.

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