

## The concept and treatment of locomotive syndrome: its acceptance and spread in Japan

Kozo Nakamura

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In 2009, the average lifespan of a Japanese male was 79.6 years and that of a female was 86.4 years. This was the highest in the world; about 60 years ago, the average in the Japanese population was approximately 50 years. It is thus apparent that Japan has rapidly been becoming an aged society. In 2010 there were 29,440,000 individuals age 65 or older; this number will increase steadily, and is expected to reach 38,630,000 by 2042. By 2055 the elderly are expected to account for 40.5% of the country's total population.

A long life has been the dream of people; once realized, however, for many it has turned out to be a source of anxiety. One reason for this is the fact that many elderly require nursing care services; their number is increasing and presently stands at 4.5 million. The main causes necessitating such care are falls/fractures (9.3%) and joint disorders (12.2%), that is, 21.5% of all patients utilizing such services are suffering from locomotive organ disorders. These are disorders which make it difficult for people to walk on their two legs.

A recent analysis of profiles of orthopaedic patients requiring surgical operations in Japan showed that until the age of 40 the prevalence differed little among the age groups, but from age 50 or older it increased rapidly. The main disorders of the elderly are osteoporosis-related fractures, spondylosis, and osteoarthritis of the knee joints [1, 2]; estimated prevalence based on their cohort study in Japan is: radiographic knee osteoarthritis ( $\geq 2$  on the Kellgren–Lawrence (KL) scale), 25.3 million; radiographic

lumbar spondylosis ( $\geq 2$  on the KL scale), 37.9 million; and osteoporosis (the criteria of the Japanese Society for Bone and Mineral Research, bone mineral density (hip)  $< 70\%$  of the young adult mean), 10.7 million. Many elderly have two or more of these disorders: 24.7 million have two disorders, the number with all three has been estimated at 5.4 million. At least 47 million had one of these disorders. These data indicate that most people have locomotive organ problems after reaching middle age.

When we realize that the aged population will continue to expand, it is clear that it is important for individuals and for society in Japan as a whole to take effective means of coping with the expected restricted walking ability after middle age. Recognizing such circumstances, the Japanese Orthopaedic Association (JOA) proposed the concept of locomotive syndrome in 2007 [3, 4]. This syndrome, or “locomo” in short, refers to those elderly who have come to need nursing care services because of problems of the locomotive organs, or have risk conditions which may require them to have such services in the future.

The countermeasures recommended against “locomo” are: preventing the deterioration of locomotive organs and the development of disorders, and maintaining and/or improving walking ability. The word “locomotive” also has the symbolic meaning of a locomotive engine, thus bringing to mind an active image and the impression that it can run for a long time if it is given regular maintenance.

The locomotive organs consist of three main elements: bones, which give the body a framework; joints and intervertebral discs, which enable the body to be mobile; and muscles and a nervous system, which move the body and/or regulate its motion. These elements work together by forming a kind of network. If these elements deteriorate beyond a specific point, they are diagnosed as osteoporosis-related fractures, osteoarthritis, spondylosis, sarcopenia,

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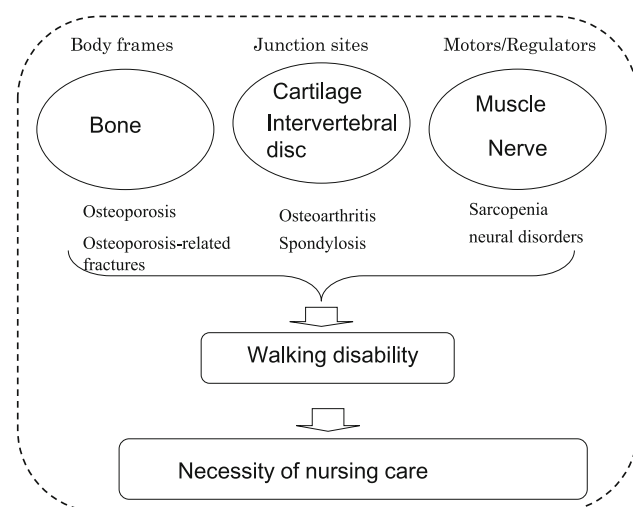
K. Nakamura (✉)  
Rehabilitation Services Bureau, National Rehabilitation Center  
for Persons with Disabilities, 4-1 Namiki, Tokorozawa,  
Saitama 359-8555, Japan  
e-mail: nakamura-kozo@rehab.go.jp

nerve disorders, etc. Figure 1 shows mutual relationships among locomotive organ disorder, gait disorder, and the requirement for nursing care. When an elderly person reaches the point where he finds it difficult to walk, he risks having to rely on nursing care from then on.

Among the signs and symptoms of “locomo” are pain, a limitation of the range of joint mobility, deformation, reduced balance capability and a slow pace of walking. In many cases, however, degeneration of the locomotive organs develops and progresses so slowly that people often fail to sense it. This makes it important for individuals to become aware of these signs and to recognize that they could be at risk of “locomo”.

It is known that those experiencing difficulty in walking, climbing stairs, going shopping, putting on a pair of socks, or doing housework in their daily life have a significantly higher risk of requiring nursing care services than those who are able to do these things without difficulty. An individual can self-check as to whether he has “locomo” or not by taking a look at his daily activities; we have prepared a self-check list for this syndrome [3]:

1. You cannot put on a pair of socks while standing on one leg.
2. You stumble or slip in your house.
3. You need to use a handrail when going upstairs.
4. You cannot get across the road at a crossing before the traffic light changes.
5. You have difficulty walking continuously for 15 min.
6. You find it difficult to walk home carrying a shopping bag weighing about 2 kg (e.g., two 1-l milk packs).
7. You find it difficult to do housework requiring physical strength (e.g., use of a vacuum cleaner to clean the



**Fig. 1** The relationship among dysfunction of locomotive organs, walking disability, and need for of nursing care

rooms, putting futons into and taking them out of the closet, etc.).

Those who are described by any of the above categories may possibly have “locomo”.

The key points in preventing the elderly from having problems with walking include reinforcing muscle strength, strengthening balance capacity, and avoiding heavy burdens on the knees and the lumbar spine.

The JOA recommends “standing on one leg with eyes open” and “half-squats” as beneficial locomotive exercises [3]. One-legged standing with eyes open is intended to enhance balance capability. A set of 1 min on each leg, and 3 sets a day are recommended. Squats are representative of muscle training for the lower half of the body. We recommend half-squats because it has a lower burden on the knees. One set is 5 or 6 squats, and 3 sets a day are recommended. These exercises are advantageous in that they can be used by an individual at home as long as care is taken not to fall down. Locomotive training at a home for the elderly has also been reported to significantly improve an individual’s one-legged standing time, muscle strength of knee extension, and walking speed [5].

Various training regimens can be devised, depending on the walking ability of each person. If an individual wants to increase the extent of training, he can exercise more frequently and/or adopt more difficult ways, for example taking an arabesque posture on one leg and one-legged squats. If normal one-legged standing or half-squatting exercises are difficult, a desk or a chair can be used as support. If one is nervous about pain in the knee or the low back, the above-described training can be combined with therapeutic exercises for the knees and the lumbar spine. When the three key points described above are achieved, various other exercises such as Tai chi chuan can be effective.

This concept has been accepted and has spread quite rapidly in Japan since it was first proposed in 2007. Locomotive syndrome has been featured many times as a health program or a current issue on TV by NHK and other commercial broadcasting stations, and several medical journals have published a special issue on the concept. It also appears frequently in local government public relations news. Its rapid spread and recognition reflects that there have already been many people who are in trouble with nursing care because of locomotive syndrome. From now on, the JOA will promote this movement even further because it contributes to the health and welfare of the nation.

Kozo Nakamura

Former President,

The Japanese Orthopaedic Association

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