



A survey of wheelchair use by paraplegic individuals in Japan. Part 2: Prevalence of pressure sores

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A cross-sectional survey was done to clarify the incidence of pressure sores in 218 self-supported Japanese paraplegic patients and to determine effective measures for prevention. The majority of patients (85.7%) had previous pressure sores, and 46.3% had undergone multiple surgeries. Some patients (17.9%) were still suffering from persistent sores which commonly developed at the ischial tuberosities, suggesting insufficiency of self-care practice during wheelchair activities. Sensory disturbance over the seating surface, urinary incontinence, and general complications were seen in 85.8%, 49.5%, and 18.8% of total subjects, respectively. They were seen as risk factors for pressure sores, but only urinary incontinence clearly increased the current pressure sore prevalence. Nevertheless, both self-care practice and sports activities, seen in 85.3% and 36.2% of total subjects, respectively, contributed to greatly reduce the incidence. A patient education system including acquisition of basic knowledge and proper technique should be established to promote effective prevention of pressure sores in Japan.

Keywords: spinal cord injury; pressure sores; prevalence; prevention

Introduction

The first half of this report focused on the characteristics of wheelchair cushions used by Japanese paraplegic patients. The second half examined the incidence of pressure sores and various physical factors contributing to their occurrence and prevention in the same sample as Part 1, to determine the most effective measures for prevention of pressure sores.

Subjects and methods

The subjects surveyed and the methods used were the same as in Part 1. In addition to wheelchair cushions, the subjects were interviewed directly about pressure sores and physical condition. Pressure sores included past history and current status of pressure sores, anatomical site, and previous surgery. The current pressure sore incidence was expressed as number of patients per 100 population (%). The survey of physical condition consisted of risk factors and preventive factors (therapeutic treatments) for pressure sores. Risk factors included sensory disturbance over the seating surface, urinary incontinence, and general complications; preventive factors included self-care practice and sport activities.

General complications were defined from questions regarding the medical control of physical condition. All diseases were recorded regardless of the degree of symptoms or contribution to pressure sore development.

Furthermore, the influence of these factors on the current pressure sore prevalence was statistically analyzed by using the χ^2 test for independence ($P < 0.01$).

Results

The numbers of patients with previous and current pressure sores are shown in Table 1. There were 143 patients (65.6%) in the past and 39 patients in the present (the current pressure sore incidence: 17.9%). The most common site was the ischial tuberosities, but the sacrum, the coccyx and the greater trochanters were also common locations for pressure sore development. A past history of pressure sores over the ischial tuberosities was recorded in 81 patients (43.3% of 187) and pressure sores had persisted at the same location in 18 patients (46% of 39).

Surgery was performed in 101 patients (46.3% of all patients, 218); 62 (61.4%) of them had experienced two or more surgical interventions, that is, one patient underwent surgery 2.6 times on an average.

Table 2 summarizes the physical condition of subjects. A considerable number of risk factors for pressure sores were seen. The majority of patients (187, 85.8%) showed sensory disturbance over the seating surface. Half of the patients (108, 49.5%) were suffering from urinary incontinence. Approximately one-fifth of total subjects (41, 18.8%) had general complications; hypertension, urinary infection, and mild liver dysfunction were very frequently observed, but only a low rate of diabetes mellitus which is closely related to tissue damage and infection was recorded.

Therapeutic treatments employed to prevent pressure sores were seen in a large number of patients; self-care management was practiced by 186 (85.3%) patients and 79 (36.2%) patients were engaging in sport activities. Attention should be paid to the fact that as many as 28 (71.8%) of 39 patients with current pressure sores were practicing self-care management.

Table 1 Previous and current pressure sores

Anatomical sites	Number of patients	
	Previous	Current
Ischial tuberosities	81 (43.3)	18 (46.2)
Sacrum	62 (33.1)	13 (33.3)
Coccyx	19 (10.1)	4 (10.3)
Greater trochanters	11 (5.9)	2 (5.1)
Others	14 (7.5)	2 (5.1)
Duplicate total	187	39
Single lesion	112	39
Multiple lesion	31	0
Real total	143	39

The total number of 187 with previous pressure sores contains duplication because 31 patients had multiple sites of pressure sore development. () Indicates percentages to each of 187 and 39. Others include the medial and lateral malleoli, the feet, the heads of fibula, the thighs, and so forth

Table 2 Physical condition

Factors for pressure sore development	Number of patients
Risk factors	
(1) Sensory disturbance over the seating surface	187 (85.8)
(2) Urinary incontinence	108 (49.5)
(3) General complications	41 (18.8)
(a) Hypertension	7 (3.2)
(b) Urinary infection	7 (3.2)
(c) Liver dysfunction (mild)	6 (2.8)
(d) Diabetes mellitus	3 (1.4)
(e) Renal dysfunction (mild)	3 (1.4)
(f) Others	15 (6.9)
Preventive factors	
(1) Self-care practice	186 (85.3)
(2) Sports activities	79 (36.2)

() Indicates percentages to the total number of patients, 218

Table 3 shows the number of patients with or without current pressure sores divided into absence and presence of various physical factors; Figures 1 and 2 display these values as percentages.

Figure 1 shows the influence of three risk factors on the current pressure sore prevalence. Only urinary incontinence showed a strong association with the prevalence; the presence of urinary incontinence tripled the prevalence from 9.1% to 26.9%.

Figure 2 shows the influence of preventive factors on the current pressure sore prevalence. Self-care practice reduced the incidence from 34.4% to 15.1% and sports activities also reduced it from 23.0% to 8.9%.

Discussion

The actual incidence of pressure sores in paraplegic patients who live independently in Japan is not well documented. Various reports from Western countries have described incidences of pressure sores among spinal cord injury patients of 25–85%,¹ 19% (C₁–C₇ level)-45% (T₁–T₁₀ level),² and 30%.³

The large number of patients with previous pressure sores in our survey (143, 65.6%) can be attributed partly to poor medical care given in hospital during the acute stage of trauma, and partly to insufficient self-care management. However, the patients with current pressure sores (39, 17.9%), 71.8% of whom were practicing self-care management for prevention, resulted from insufficient knowledge or improper management technique. The ischial tuberosities were the most favorite site of pressure sore development because they often create the maximum pressure on the seating surface.²

The high population (46.3%) of patients with a history of surgery indicates insufficient appropriate action taken to prevent the progression of sores from mild to severe. Moreover, the frequent surgery (2.6 times for one patient on an average) suggests a lack of awareness that pressure sores can cause considerable problems including life-threatening complications.⁴

Table 3 Number of patients divided in the absence/presence of current pressure sores and various physical factors

Physical factors	Current pressure sores	
	Absent	Present
Sensory disturbance over the seating surface	Absent	26
	Present	5
Urinary incontinence	Absent	153
	Present	34
General complications	Absent	100
	Present	10
Self-care practice	Absent	79
	Present	29
Sports activities	Absent	145
	Present	32
	Absent	34
	Present	7
	Absent	21
	Present	11
	Absent	158
	Present	28
	Absent	107
	Present	32
	Absent	72
	Present	7

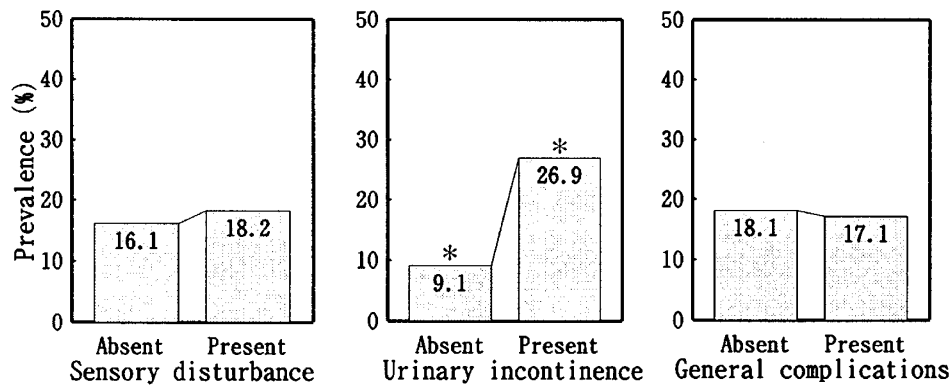


Figure 1 The influence of risk factors on the current pressure sore prevalence. *Significant difference at $P < 0.01$ level

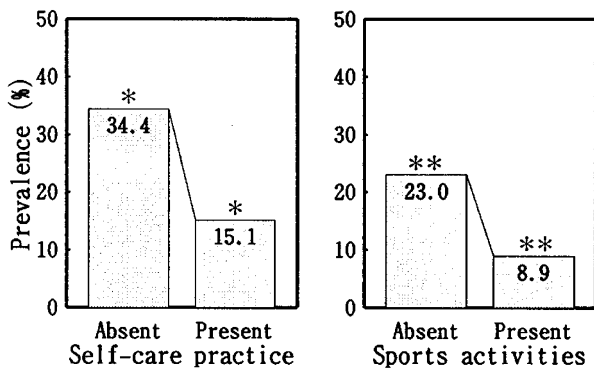


Figure 2 The influence of preventive factors on the current pressure sore prevalence. ***Significant difference at $P < 0.01$ level

Although ischial pressure sores tend to recur frequently,⁵ sufficient education of the patients can help them recognize the necessity of self-care management and acquire proper techniques.

Pressure sore prevention requires an understanding of etiology, risk factors, complications, medical management, and prevention.⁶⁻⁸ Pressure sore preventive techniques consist of proper positioning⁹ and transference of weight,¹⁰ pressure-relieving motion,¹¹ and effective wheelchair cushioning.²

Although impaired sensation unquestionably induces pressure sores in spinal cord injury patients,⁴ the current pressure sore prevalence showed no difference between absence or presence of sensory disturbance. This may have resulted from insufficient physical examinations of the buttock areas.

It has been widely accepted that urinary incontinence promotes pressure sore development by causing excoriation and maceration of the skin,¹² and our result coincides with this opinion. Since the current pressure sore prevalence tripled in the presence of urinary incontinence, the importance of urological management cannot be overemphasized.

General complications largely included diseases irrelevant to current pressure sore development such

as hypertension and mild liver dysfunction. Moreover, such diseases relevant to pressure sore development as urinary infection and diabetes mellitus were under regular control at outpatient clinics. For these reasons, the current pressure sore prevalence showed no changes in the presence of general complications.

The marked reduction of pressure sore prevalence with self-care practice proved its important role in the prevention of pressure sores. A greater effect can be expected by showing patients basic information and proper techniques for pressure sore prevention systematically as a medical service.³ Various textbooks written for this purpose can be applied for teaching.^{12,13}

Sports activities are also useful to reduce pressure sore prevalence largely. By engaging in sports, spinal cord injury patients can not only prevent disuse, but improve respiratory/circulatory functions and energy consumption,¹⁴ and get rid of stress. Moreover, sports activities activate their entire lives, motivating regular self-care management. Therefore, sports activities should be highly recommended in patient education.

Based on the above considerations, we believe self-care practice is essential for paraplegic patients to effectively prevent pressure sores. A patient education system including acquisition of basic knowledge and proper technique should be established as a medical service to encourage and motivate them to undertake regular self-care management, in combination with the wheelchair cushion management described in Part 1. In addition to this survey, a follow-up survey should also be done to observe changes in pressure sore prevalence among Japanese paraplegic patients.

Conclusion

A survey of the same sample as Part 1 revealed many patients with a history of pressure sores (143, 65.6%) and high incidence of current pressure sores (39, 17.9%) with ischial tuberosity sores being predominant. Moreover, approximately half of the patients (101, 46.3%) had undergone surgery, including multi-

ple surgeries in 61.4%, suggesting insufficient self-care practice.

Risk factors for pressure sores including sensory disturbance over the seating surface, urinary incontinence, and general complications were seen in 85.8%, 49.5%, and 18.8% of total subjects, respectively. The current pressure sore prevalence tripled in association with urinary incontinence.

Self-care practice and sports activities, as contributing factors to pressure sore prevention, were seen in 85.3% and 36.2% of total subjects, respectively. Both markedly reduced the current pressure sore prevalence.

A patient education system including acquisition of basic knowledge and proper technique for self-care management, in combination with a wheelchair cushion management system, should be established as a medical service to encourage and motivate paraplegic patients in Japan to effectively prevent pressure sores.

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References

- 1 Dinsdale SM. Decubitus ulcers: role of pressure and friction in causation. *Arch Phys Med Rehabil* 1974; **55**: 147–152.
- 2 Noble PC. The prevention of pressure sores in persons with spinal cord injuries. World Rehabilitation Fund: New York, 1981.
- 3 Staas WE, Cioschi HM. Pressure sores – a multiple approach to prevention and treatment. *West J Med* 1991; **154**: 539–544.
- 4 Yarkony GM. Pressure ulcers: a review. *Arch Phys Med Rehabil* 1994; **75**: 908–917.
- 5 Berry RB. The late results of surgical treatment of pressure sores in paraplegics. *British J Surg* 1980; **67**: 473–474.
- 6 Ferguson-Pell MW, Wilkie IC, Reswick JB, Barbenel JC. Pressure sore prevention for the wheelchair-bound spinal cord injury patient. *Paraplegia* 1980; **18**: 42–51.
- 7 Rueler JB, Cooney TG. The pressure sore: pathophysiology and principles of management. *Ann Intern Med* 1981; **94**: 661–666.
- 8 Krouskop TA, Noble PC, Garber SL, Spencer WA. The effectiveness of preventive management in reducing the occurrence of pressure sores. *J Rehabil Res Dev* 1983; **20**: 74–83.
- 9 Zacharkow D. Wheelchair posture and pressure sores. Charles C Thomas: Springfield, 1984.
- 10 Hobson DA. Comparative effects of posture on pressure and shear at the body-seat interface. *J Rehabil Res Dev* 1992; **29**: 21–31.
- 11 Henderson JL, Price SH, Brandstater ME, Mandac BR. Efficacy of three measures to relieve pressure in seated persons with spinal cord injury. *Arch Phys Med Rehabil* 1994; **75**: 535–539.
- 12 Bedbrook GM (ed). Lifetime care of the paraplegic patient. Churchill Livingstone: New York, 1985.
- 13 Phillips L, Ozer MN, Axelson P, Chizeck H. Spinal cord injury – A guide for patients and family. Raven Press Books: New York, 1987.
- 14 Zwiren LD, Bar-Or O. Responses to exercise of paraplegics who differ in conditioning level. *Med Sci Sports* 1975; **7**: 94–98.