Effect of Rolling Bed on Decubitus in Bedridden Nursing Home Patients

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IZUTSU, T., MATSUI, T., SATOH, T., TSUJI, T. and SASAKI, H. *Effect of Rolling Bed on Decubitus in Bedridden Nursing Home Patients.* Tohoku J. Exp. Med., 1998, 184 (2), 153-157 — Decubitus is one of the most difficult management problems encountered in bedridden elderly patients. Relief of pressure over decubitus is the most important principle of the management. We developed a rolling air cushion bed which turns the patient to a 15-degree inclined lateral position with an inflating ripple mattress, a longitudinally aligned air inflatable tube. The position of the patients was changed between right and left laterals and to supine every 15 minutes automatically. Nineteen bedridden patients with decubitus used the rolling air cushion bed for 3 months and 12 bedridden patients with decubitus used a conventional bed and had their position changes every 2 hours by care givers. Severity of decubitus was divided into 4 grades and the decubitus significantly improved from 2.8 (S.E. 0.2) to 2.0 (S.E. 0.3) after 3 months in patients using the rolling air cushion bed, while in patients with conventional beds it changed from 3.0 (S.E. 0.2) to 3.2 (S.E. 0.2) (not statistically significant). We suggest that the rolling air cushion bed would be beneficial to decubitus relief in bedridden elderly and may relieve labor by care givers. ——— rolling air cushion bed; bedridden elderly; lateral position; care givers; pressure sore
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Decubitus or pressure sores are one of the most difficult management problems encountered in geriatric patients and is common among those confined to beds or wheelchairs. The lesion is better classified as a systemic rather than a cutaneous disorder because major illness involving at least one and usually several organ systems is invariably present. Indeed, decubitus are a major problem in clinical medicine precisely because the predisposing factors are of paramount importance and rarely correctable. Since pressures up to 70 mmHg at the sacrum and 45 mmHg at the heels are generated when the body is supine, it is not surprising that decubitus may arise in as little as an hour of total immobility (Phillips and

Received December 25, 1997; revision accepted for publication January 5, 1998.

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Gilchrest 1988). Once decubitus occurs, healing may be retarded by general inanition. Prevention, although difficult in high-risk patients, is much easier than cure. Relief of pressure over decubitus is the most important principle of management. The simplest method is frequent turning of the bedridden patients, at least every 2 hours.

In the present study, we developed a rolling air cushion bed which turned the position of bedridden patient at every 15 minutes between right and left lateral positions and the supine position automatically. We tested how the bed improved the decubitus condition and compared this to decubitus of bedridden patients who used a conventional bed with turning at every 2 hours by care givers.

SUBJECTS AND METHODS

We examined 31 bedridden patients (78 [s.e. 4] years, 13 men, 18 women) with decubitus admitted to Miki Hospital, a longterm care facility located in Maesawa Town, Iwate Prefecture, Japan. The patients were divided into two groups. One group of 19 patients (79 [s.e. 4] years, 7 men and 12 women) were treated with 19 rolling air cushion beds and another group treated with a conventional bed with their positions being changed at every 2 hours between right and left laterals and to supine position by care givers.

We excluded patients who were immunocompromised (i.e., as a result of acquired immunodeficiency syndrome, metastatic cancer, or cancer therapy) and patients with mycobacterial infections. All other patients with or without well documented cerebral hemispheric strokes were included. All patients were able to eat with support. Before the study, patients with decubitus were followed for more than 3 months. Ethical approval was granted by the Tohoku University Ethics Committee, Sendai, Japan, and informed consent was obtained after the nature of the procedures had been fully explained.

The rolling air cushion bed was made by Morten company (type RACB-1, Hiroshima), which turned the bedridden patients to a 15-degree inclined lateral position by an inflating ripple mattress, a longitudinally aligned air inflatable tube. The position of the patients was changed between right and left laterals and to supine every 15 minutes automatically. Nineteen rolling air cushion beds were used simultaneously which were investigated for the present study.

Decubitus were observed according to clinical staging or grading (Neitch 1991). Clinical description of decubitus was as follows. Grade 1 is decubitus with acute inflammatory response primarily in the epidermis with minimal soft tissue swelling and warmth. Grade 2 is decubitus with an inflammatory and fibroblastic response extending through the epidermis into the dermis and there is partial thickness or superficial skin loss involving the epidermis and/or the dermis. Grade 3 is decubitus clearly penetrating the subcutaneous layers and often there is exposed muscle and tendons. Grade 4 is decubitus extending beyond the deep fascia, almost always to the bone. Deep tissue destruction

occurs extending through the subcutaneous tissue and fascia. Grade of decubitus was observed every month and followed for 3 months in both groups. Decubitus was treated with a paste of 70% sugar and 3 % povidone-iodine produced by Khowa-shinyaku Co. (Nagoya) in both groups (Miyachi and Imamura 1990).

Patient age ($\chi^2=2.0$, $p>0.50$), duration of hospitalization ($\chi^2=1.9$, $p>0.50$), underling medical conditions (e.g., serum protein, anemia and mutation) ($\chi^2=0.69$, $p>0.40$) and pre-existing illness (e.g., diabetes mellitus) were similar between two groups. Values are expressed as mean $\pm$ s.e. Statistical analysis was performed by the Kriskal-Wallis test followed by the Mann-Whitney test, or by the chi-square test, where appropriate. The statistical significance was set at $p<0.05$.

RESULTS

The decubitus occurred mostly in the pelvic area and some on the lower extremities. If the decubitus occurred on more than two areas, we adopted the most severe decubitus for the study. Grade of decubitus improved from 2.8 (s.e. 0.2) to 2.0 (s.e. 0.3) ($p<0.01$) after 3 months in patients lying on the rolling air cushion beds, while in patients with conventional beds it changed from 3.0 (s.e. 0.2) to 3.2 (s.e. 0.2) ($p>0.5$) (Fig. 1). Size of decubitus was also measured but there were no significant differences between both groups (Fig. 2). Five patients complained of seasickness but they acquainted soon. We studied all of the patients for 3 months.

DISCUSSION

Relief of pressure over decubitus is the most important principle in care

Fig. 1. Grades of decubitus were followed for 3 months in patients treated with the rolling bed (●) and patients without the rolling bed (○). * ($p<0.05$) and ** ($p<0.01$) show significant differences between two groups. Grades of decubitus at 2 and 3 months were significantly decreased from the initial grade in patients with the rolling beds.

Fig. 2. Size of decubitus were followed for 3 months. There were no significant differences among them. Marks are the same as Fig. 1.

management of decubitus. Turning the bedridden patients at every 2 hours is hard work for care givers. In order to relieve pressure sores, air-or fluid-filled mattresses or supersoft support mattresses tend to equalize pressure over the entire area of contact and are thus a great improvement over conventional mattresses. The best of the currently available support surface is the ripple mattress, a series of contiguous, horizontally aligned inflatable tubes. A machine pump repeatedly inflates and deflates the tubes every 5 to 10 minutes in an alternating pattern, so that the patient is supported first by the even-numbered tubes and then by the odd-numbered tubes, and no area is continuously weight-bearing for more than the 5 to 10 minutes pump cycle time (Phillips and Gilcrest 1988).

In the present rolling air cushion bed, the patient was turned to a 15-degree inclined lateral position by inflating the ripple mattress, in which the inflatable tubes with air were aligned longitudinally. The position of patients was changed every 15 minutes between right and left lateral positions and to supine position. Thus the present rolling air cushion bed appears like natural position changing by care givers. Seiler et al. (1986) found that the patient should be regularly turned to a 30-degree inclined lateral position, which has been shown to be superior to the 90-degree lateral position. But in the present study, rolling with the air cushion bed to a 30-degree lateral position seems to frequently cause seasickness. An 8-degree lateral position seems to have little effect on the relief of pressure sores. We adopted the 15-degree lateral position. During sleeping, healthy subjects change their position from 20 to 40 times a night. Therefore, turning would be the most important care for bedridden elderly. The present study is the first report that turning with a machine improved the decubitus.

Turning at every 2 hours by care givers is recommended in order to prevent decubitus in bedridden patients. However, conventional turning of the bed-

ridden patients at every 2 hours did not improve decubitus. Cure of decubitus is more difficult than prevention of decubitus (Kennedy 1992). Decubitus does not only depend on medical factors but also depends on social problems, such as more labor by care givers. In the present study, we observed the changes of decubitus in patients with decubitus from the beginning of the study. Since the present rolling air cushion bed improved clinical staging or grading of decubitus, it may also be useful to use for prevention of decubitus. In order to prove the benefit of the rolling bed on prevention of decubitus, large number of bedridden patients should be tested. Because the limited number of the rolling bed, we could not study the prevention of decubitus in the present experiment. The growing number of bedridden elderly suggests a shortage of care givers in the future in Japan. The rolling care bed would be beneficial to solve the shortage of care givers.

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