The THAI Journal of SURGERY 2005; 26:39-42.
Official Publication of the Royal College of Surgeons of Thailand

Pressure Sore Prevention Bed: A New Medical Device for Pressure Sore Prevention

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Abstract

Introduction: **Pressure sore is a complication usually found in patients who cannot mobilize themselves. Turning the patient every two hours can prevent pressure sore development but consumes a lot of time and personnel. A modern pressure relief device can be an alternative, but the high price and high maintenance cost make it unaffordable for low income families. With these problems, a new device, Pressure Sore Prevention Bed (PSPB) was thus invented.**

Materials and Methods: **PSPB is a medical device which consists of two components, the bed and the inflated rubber balloons. The bed is designed in a rectangular shaped sac, 84× 42 × 3 inches in size, separated into 12 small spaces or compartments. Each space is filled with 6 inflated rubber balloons to hold the patient's weight. Patients who were at risk of pressure sore development or patients who already had pressure sore were assigned to use PSPB instead of a conventional hospital bed. Patients need not change positions every two hours while using this medical device.**

Results: **PSPB can prevent pressure sore development in a high risk patient and can prevent a new lesion in a patient who already has pressure sore. The patient can lie in the same position for a longer period without developing pressure sore. The inflated balloons can hold the weight of the patient for 10-14 days, depending on the patient's weight.**

Conclusions: **PSPB is a new medical device which can prevent pressure sore development. With low-price, low-maintenance and easy-to-use qualities, this innovation is a highly cost-effective self-made medical device.**

Pressure sore is a complication that is usually found in patients who cannot mobilize themselves, such as the paralysed, the comatosed and sometimes the floppy old age.[1] The condition is complex and needs multimodality treatment.[2,3] To combat infection with antibiotics and the need of repeated debridement and nutritional support for wound healing render the treatment of this condition an expensive one. Prevention of the development of pressure sores is the major goal and must be implemented to those who are at risk. Changing position of the patient every two hours to prevent skin necrosis is the best method but it is also a hard task because it consumes a lot of time and personnel and is usually impossible when the patient is at home. A modern, commercial pressure relief device may be an alternative, but the poor cannot

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afford its high price and high maintenance cost. With these problems, a low-price Pressure Sore Prevention Bed (PSPB) was invented.

Materials and Methods

PSPB consists of two components, the bed and the inflated rubber balloon. The bed is a rectangular shaped sac with the length of 84 inches, 42 inches wide and 3 inches in height. It is divided equally into 12 small compartments (Figure 1). Each compartment has an opening for the insertion of balloons. The balloon is an ordinary rubber balloon which is round in shape and has thick walls. To compose a PSPB, the balloon is inflated with a hand pump until its circumference reaches 21 inches (smaller than its full size) and tied with a rubber band at its distal end (Figure 2). Each compartment is tightly packed with 6 inflated rubber balloons. One bed requires altogether 72 balloons to hold the patient's weight (Figure 3).

PSPB is then placed on a conventional hospital bed (Figure 4). The high risk patient could lie in the same position for a longer period of time without having to be turned every two hours. Everyday, the caretaker, nurse or parents, should examine the patient's skin and bed. If the balloons are deflated, they should be re-inflated or replaced by new ones. Patients who already have pressure sores should lie on the intact side and not on the wounds which should be treated as per usual guidelines.

Fig. 1 A rectangular shaped sac.

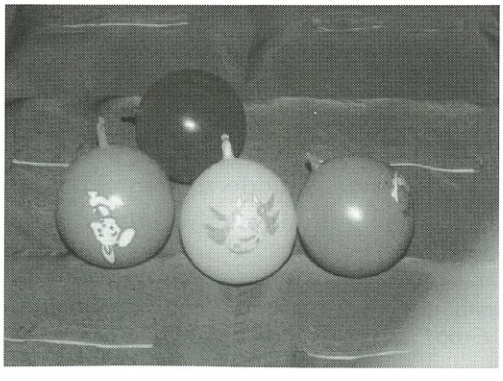

Fig. 2 The size of balloons and rubber band position.

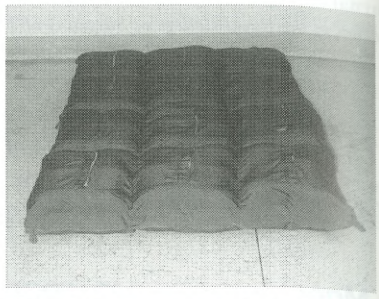

Fig. 3 PSPB was completely composed.

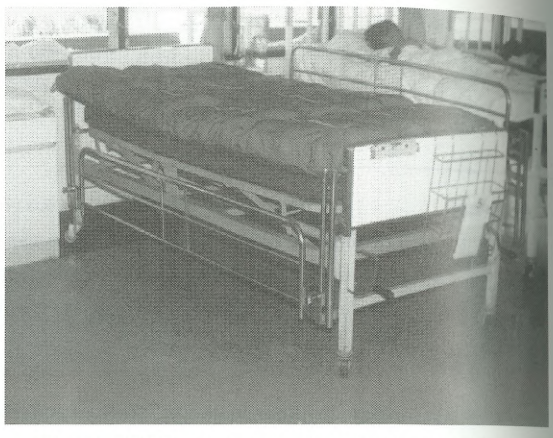

Fig. 4 PSPB was applied on the hospital bed.

Results

PSPB could prevent pressure sores in high risk patients. Once applied, the patient could lie in the same position for a longer period of time without developing pressure sores. An old woman with left intertrochanteric fracture developed early stage pressure sore at coccyx (Figure 5). After skin traction and the use of PSPB for 3 weeks, the lesion healed. She did not develop new pressure sores on her right hip where she lay (Figure 6). In patients with pressure sores, PSPB could prevent new lesions while treating the present one. A quadriplegic young man, after a

Fig. 5 Early stage of pressure sore at coccyx.

Fig. 6 Three weeks after PSPB used.

Fig. 7 Large pressure sore and sacrum and coccyx.

motorcycle accident (Figure 7), developed a large pressure sore at sacrum and coccyx after skull traction treatment and was transferred to the surgical unit to treat for pressure sores. The PSPB was used to prevent new lesions and the patient was assigned to lie on his sides. After a course of antibiotics, nutritional support and repeated debridement, the wound gradually healed with satisfactory results (Figure 8) and no further pressure sores developed.

Fig. 8 Eighteen weeks after PSPB used.

Fig. 9 PSPB could hold large amount of weight.

Discussion

PSPB can support as much as 457 kilograms (8 nurses) without rupturing the balloons (Figure 9). Why can the PSPB hold such a large amount of weight? Firstly, the large number of balloons (72 balloons) helps to distribute and thus reduce the weight upon each balloon, so each balloon receives only a small amount of weight. Secondly, each balloon was inflated under its full size, as a result there was a spare "neck" that could absorb more pressure and thus reduced its surface tension and enabled the balloons to tolerate heavy weight.[4] Another question is why the patient could lie in the same position for a longer time without developing pressure sores. The elastic property of a rubber balloon that could increase contact surface with parts of the body helped decrease the pressure on the contact surface between the balloon and the skin. This contact pressure may not be high enough to disturb the skin circulation. Further more, the wavy surface of PSPB may help ventilate the skin moisture which is one of the factors of pressure sore development. PSPB is also easy and convenient for use at home. With its light weight and no electricity need, it can be carried

Fig. 10 With light weight, PSPB was easy to carry.

anywhere, indoors or outdoors (Figure 10). Each day, the caretaker (nurse or parents) only inspects the skin and the balloons, reinflating or changing a new balloon when necessary. The balloons can support the weight of the patient for approximately 10-14 days and each balloon costs only 1 Baht.

Conclusions

PSPB is a self-made medical device that can satisfactorily prevent pressure sores. It significantly reduces the workload of the caretaker. With its easy use, low price and low maintenance cost, PSPB is a cost-effective, locally made medical device.

However, further studies in a larger population sample should be carried out to determine and compare the pressure at contact areas, the proper treatment protocol and the healing process in patients using this device. The comparative study of the development of pressure sores in patients using PSPB and regular hospital beds should also be carried out.

REFERENCES

1. O'Dea K. Prevalence of pressure sores in the UK. J Wound Care 1993; 2: 221-5
2. Srisuphan V, Senarat V, Pichiansathien V, Singkamphoo L, Wuthanont N. Care of patients with pressure ulcers. Chiangmai Nantaphan; 2004. p. 1-3.
3. Bryant RA, Shannon ML, Pieper B, Braden BJ, Morris DJ. Pressure ulcers. In: Bryant RA, editor. Acute and chronic wounds nursing management. Missouri: Mosby-Year Book Inc; 1992. p. 111-3, 127-8.
4. Komindr S, Charnpreecha T, Laoheng A, Thongkamwong S. Ramathibodi pressure-ulcer preventing bed (PUP bed-Rama I). Pressure reducing efficiency. Bull Dept Med Serv 2000; 25: 271-7.