

Ekishibo® Cushioning for Wheelchairs



Nitto Denko Medical Manufacturing Co., Ltd.

KIKUTA NoriyukiBusiness Development Department
Healthcare Business Unit
Medical Division**SUZUKI Seishi**

1 ▶ Introduction: Prevention of Decubitus Ulcers in Wheelchair Users

With the progression of the aging society, decubitus ulcers (bedsores) are becoming one of the systemic conditions that medical care professionals frequently have to treat. The speed of the increase is so fast that in 2002 a scheme was introduced to reduce national health insurance remuneration* to medical care facilities which had not put in place measures to reduce the incidence of decubitus ulcers.¹⁾ Although this stimulated hospitals to take relevant measures, these focus on beds, with insufficient attention paid to wheelchairs. Particularly now that nursing care insurance has been introduced and care in the home is well developed, there are estimated to be large numbers of elderly people and patients with spinal injury who spend most of the day in a wheelchair in a non-hospital environment, where prevention of decubitus ulcers tends to be neglected.

People who need to use a wheelchair in everyday life have mostly experienced deterioration of muscular strength due to age or have become paraplegic due to spinal injury or other causes. Elderly people and patients in these categories are unable to alter their posture at will and the ischial, sacral, and other prominent bones are therefore subject to unrelieved pressure for long periods, which leaves them exposed to increased risk of decubitus ulcer developing through impaired bloodflow in the body tissues. As it is also difficult for them to maintain posture unassisted, it can sometimes happen that they lose support and slide out of the chair.²⁾ In order to improve the quality of life for wheelchair users, measures are therefore needed to maintain appropriate posture and to relieve the concentration of load on prominent areas of bone so as to prevent decubitus ulcers³⁾.

The specially designed wheelchair cushions in general use include aircell cushions, foam cushions, and single-material gel cushions. Aircell cushions have excellent performance in dispersing load, but the shear force exerted on the body tissues by force in the lateral direction is great¹⁾ and there are additional maintenance issues such as the need to regularly adjust the air pressure level. The foam cushion avoids these inconveniences but is not as effective as the aircell type in

relieving pressure or shear force. The gel cushion is excellent at relieving shear force, but has inferior performance in load dispersion. The Ekishibo® GF7033 cushion, developed for use with folding wheelchairs and pictured in **Photo. 1**, is a groundbreaking product that combines high performance in load dispersion and shear force relief with the posture maintenance function which has hitherto been largely disregarded in wheelchairs.

**Photo. 1 Ekishibo® GF7033**

*This means that a reduction is made in the standard fees paid to the medical care facility in question (e.g. a hospital) in order to reduce its level of remuneration where it fails to do any one of the following: (1) provide a decubitus ulcer prevention team (2) evaluate risk factors for decubitus ulcer (3) make appropriate use of body pressure-dispersing mattresses or similar. The handling of points (2) and (3) above has however been amended subsequently.

2 ▶ Structure of Ekishibo® GF7033

(1) Load Dispersion Function: Gel Foam

As shown in **Fig. 1**, the gel foam used in the cushioning material of the Ekishibo® is molded in one integral piece with the anchor that forms the substrate. The gel foam is a type of urethane foam in which, unlike regular low-repulsion ure-

thane, a gel structure and a foam structure are co-present. This means that, when it is placed under pressure, in addition to the cushion effect of the foam component, a flexibility contributed by the gel structure is experienced, allowing the cushion to readily absorb not only loads acting in the vertical direction but also force acting in the lateral direction.¹⁾ As the direction of the force exerted on the seat surface changes with shifts in human posture, this absorption of force regardless of direction is a feature useful in wheelchair cushions.

(2) Posture Maintenance Function: Anchor

As shown in **Fig. 1**, the material used in the anchor is of low flexibility and mimics the shape of the buttock and thigh area in sitting position. There is a hole corresponding to the buttock area and the material is filled with a thick layer of soft gel foam. This means that the points under greatest pressure, such as the ischium, sacrum, coccyx, and other prominent bones, are gently enveloped, creating pressure conditions close to those of hydrostatic pressure⁴⁾ and relieving the concentration of pressure on one site. In the thigh area, the anchor is thicker while the gel foam layer is thinner, so that the cushion here is harder overall than in the buttock area. This means that the thigh area does not sink down, the body is supported, and posture remains stable.

Between the hard area at the thigh and the soft area at the buttock, there is a gradual transition in the degree of hardness so that the pressure on the body tissues changes in a continuous way, avoiding any uncomfortable sudden contrast.

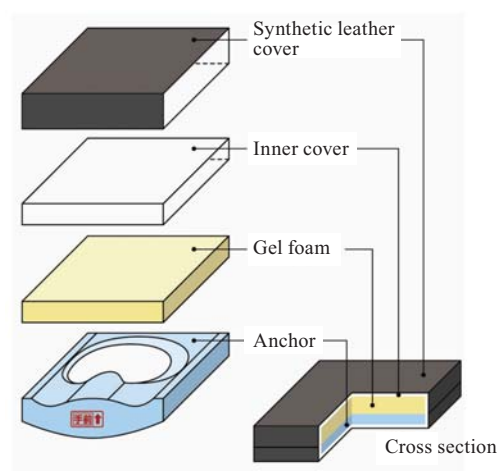


Fig. 1 Structure of Ekishibo®

3 ▶ Combining Load Dispersion Performance with Posture Maintenance Performance

Figure 2 shows data on load distribution collected when the Ekishibo® was used on a wheelchair alongside data from an air cell cushion reportedly of high performance. For the measurement, a pressure distribution measurement device manufactured by Verg Inc. and known as a force-sensing array (FSA)

was used. As is clear from the data, the load dispersion performance of the Ekishibo® is equal or superior to that of the air cell cushion; furthermore it has superior performance in posture maintenance. This not only means that it can be expected to reduce risk of decubitus ulcer occurring, but that it also realizes an improvement in the quality of life of the user¹⁾.

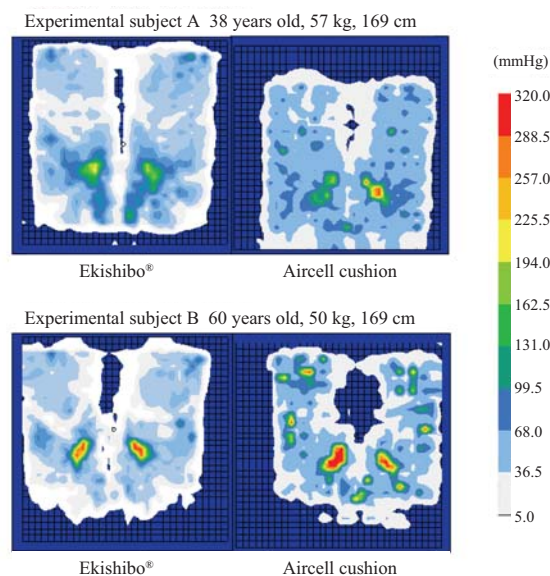


Fig. 2 Pressure distribution of Ekishibo® and air cell cushion

Ekishibo® has equal performance to an air cell cushion reported to be of high performance.

4 ▶ Conclusion

The product presented above was developed with the aim of reducing pain and discomfort in patients and elderly people using wheelchairs and improving the quality of their everyday life. So as to achieve this goal for even more people, we intend to carry out further improvements and introduce measures to raise the efficiency of the production process.

Acknowledgment

We offer our warmest thanks to Professor Emeritus Oura Takehiko, Ph.D., of Hokkaido University and Associate Professor Takahashi Makoto, Ph.D., of the Hokkaido University Graduate School of Information Science and Technology, who provided enormous guidance and support in the development of the product.

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