FIBICO – Anti-decubitus system based on elastomer with a radial design

The Challenge

Pressure ulcers, also known as decubitus ulcers, pressure sores, or bedsores, are localized damage to the skin or underlying tissue that usually occur over a bony prominence as a result of long term pressure, or pressure in combination with shear or friction Areas particularly prone to pressure sores are those that cover the bony areas such as the occiput, trochanters, sacrum, malleoli, and heel Pressure ulcers are a major problem for national healthcare systems since they frequently occur in hospitalized patients, negatively affecting the patients' quality of life by extending the duration as well as increasing the costs of hospitalization Protection is the best way to prevent ulcers Any pressure causing damage to skin or tissue must be removed immediately For this purpose, there are many special mattresses, cushions, and protective devices that can relieve the external pressure on vulnerable areas of body limbs However, traditional anti decubitus suspension systems have a series of closure elements (such as Velcro straps) and a fastener that partially holds part of a patient's body, making such systems poorly breathable With this in mind, researchers from the Reina Sofía University Hospital of Cordoba and IMIBIC (the Maimonides Biomedical Research Institute of Cordoba, Spain have developed an anti decubitus system based on elastomers with a radial design, that can be adapted to any part of a patient's body without the use of Velcro straps or fasteners

Technology description

The new anti-decubitus system is based on elastomer, a polymeric material that behaves elastically. The high flexibility of this material cushions the weight of the patient's body, reducing pressure and, consequently, reducing the patient's discomfort. This technology allows the design of anti-decubitus devices for different parts of the body, such as the back and sides of the head, scapulas, hips, heels, ankles, etc. This system consists of a two-level structure interconnected by elastomer nerves, which assume the patient's weight. The radial design with circumferential nerves distributes the pressures, passing part of the axial pressure to the radial plane. As mentioned above, this system allows the design of specific devices for different parts of the body that may be affected by bedsores.

Prototype designed forheels and ankles

The researchers have developed a prototype design for heels and ankles as an example, which consists of a main element and a complement. The main element has two parts. The first one supports the patient's foot and has greater flexibility. Its curvature is mainly intended to reduce the pressure applied to the foot. The second part is underneath, in contact with the bed, and distributes the pressure uniformly. This second area is more robust due to the higher density of the elastomer nerves, which provide rigidity and stability to the device. Additionally, the complement can be adjusted to the main element to prevent clubfoot, as it maintains a 90-degree angle between the patient's foot and leg.

Benefits of blood clotting monitoring

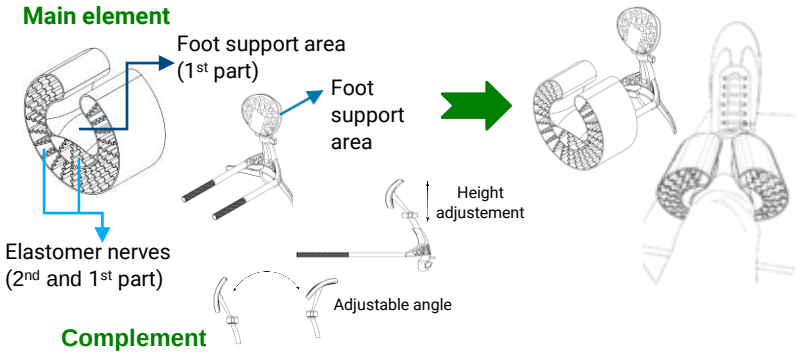
The new system presents multiple advantages over existing ones:

- **Reduction of the pressure exerted on the patient's body**, thanks to its design with radial nerves that distributes the pressures uniformly.
- **Increased patient comfort**, due to the high coefficient of flexibility of the elastomer material.
- **Reduction of the material required** for cushioning the patient's weight, which involves a **reduction in manufacturing costs** and **reduces the weight** of the device.
- Its perforated design **prevents sweating, odors, and slippage**, reducing the patient's discomfort.
- **Versatility**, the system can be used to design anti-decubitus devices for application on different parts of the patient's body.
- The prototype for heels and ankles allows the patient's mobilization without the need to remove the device, **facilitating healthcare professionals' work**.
- The proposed design does not require fasteners and the complement is adjustable, making it **comfortable** and **adaptable for each patient's needs.**

Stage of development

The device is currently in TRL 6 A prototype has been developed and lab-tested by clinical and technical staff An injection mold (using silicone or rubber) can be developed to perform usability tests and the needed clinical trials with patients at the hospital A utility model has been requested to the Spanish Patent and Trademark Office, with priority date in September 2021.

Figure 1: Design of the anti-decubitus device for heels and ankles.



View of the main element and the complement separately and assembled.

Figure 2: Prototype of the anti-decubitus device for heles and ankles

Represented Institution and inventor:

The invention has been co-developed by researchers that belong to the Physical Medicine and Rehabilitation Unit from Reina Sofía University Hospital of Cordoba and engineers from the Maimonides Biomedical Research Institute of Cordoba (IMIBIC) and the Foundation for Biomedical Research of Córdoba (FIBICO). Together they constitute a group with extensive research experience in Physical Medicine

Objective of the collaboration:

The represented institution is looking for a collaboration that leads to a commercial explotaitation of the presented invention. The ideal scenario for the institution would be to reach an agreement in order to transfer the technology use by sale or a license (exclusive or non-exclusive). However, the form, terms, and conditions of the collaboration can be openly discussed if the presented technology is of interest

Dossier visual elaborado en colaboración con la empresa ViromiiInnovationS.L en el ámbito del expediente de contratación FIB SE 01/2021