An Innovative Compression System Providing Low, Sustained Resting Pressure and High, Efficient Working Pressure

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An innovative compression system providing low, sustained resting pressure and high, efficient working pressure

Josefin Damm,1 Torbjörn Lundh,2 Hugo Partsch,3 Giovanni Mosti4
1PressCise AB, Herrljunga, Sweden; 2Chalmers University of Technology, Gothenburg, Sweden; 3Medical University of Vienna, Austria; 4Angiology Department, Clinica MD Barbantini, Lucca, Italy

Introduction

Chronic venous insufficiency (CVI) can cause considerable morbidity and reduced quality of life.1 Compression therapy, such as bandages and stockings, is the cornerstone and golden standard in the prevention and treatment of CVI today.2 It is also shown that compression used after the healing of ulcers, reduces the rate of recurrence.3 However, one great challenge is that by applying a stiff bandage, either as a single component or as a part in a multi-component product, one always adds, a not so easily quantified, resting pressure. In order to achieve the most effective and well tolerated compression treatment, one in the 2nd pilot-study, due to some oedema drop of working pressure in the evening day and treating the FixPatch™ one in the 2nd pilot-study, due to some oedema drop of working pressure in the evening day and treating the FixPatch™. As expected, there were a significant difference in the working pressure and the resting pressure. With the patches, resting pressure was maintained at a well-defined pressure, with minimal variability. Several patches (PressPatch™ by PressCise AB) made in a hook and loop material and with an optimal shape, were attached to the elastic bandage, creating a multicomponent compression system (Lundatex® system by PressCise AB). The patches adhere directly to the bandage material without any force being added; hence there is no increase of resting pressure. In the front of the leg a special patch was added (FixPatch™ by PressCise AB). This patch can be opened easily e.g. every morning, in order to maintain the pressure level over time. In one pilot-study interface pressures were measured on point B1 and C on patients with severe venous reflux in the great saphenous vein (CEAP C2-C5), during lying and standing (n=18). Three consecutive measurements were done: 1) the elastic bandage applied to the leg with a pressure of 20 mmHg, 2) the elastic bandage applied to the leg with a pressure of 30 mmHg and 3) after attaching the stiff patches to the elastic bandage. In a second pilot-study the pressure was measured on one healthy volunteer at B1, over seven days. Measurements were taken in supine, at dorsal flex and standing position, twice a day. The pressure-measuring device used was PicoPress® (by Microlab Italia).

Aim

The goal is to find a method to provide a well-defined resting pressure and a method that increases the working pressure without changing the pre-defined resting pressure, as well as maintaining the pressure over time.

Materials and Methods

First, an elastic compression bandage (Lundatex® medical by PressCise) providing and maintaining a certain pressure level was applied on the leg. The bandage is based on Laplace’s law, where the pressure is a product of the force, times the overlap, times the curvature. The bandage is provided with visual guidelines for correct stretch per each turn and correct overlap. Due to the specific elastic properties in the material the force is adjusted to the changes in curvature when the guidelines are followed. This result in a well-defined pressure, with minimal variability. Several patches (PressPatch™ by PressCise AB) made in a hook and loop material and with an optimal shape, were attached to the elastic bandage, creating a multicomponent compression system (Lundatex® system by PressCise AB). The patches adhere directly to the bandage material without any force being added; hence there is no increase of resting pressure. In the front of the leg a special patch was added (FixPatch™ by PressCise AB). This patch can be opened easily e.g. every morning, in order to maintain the pressure level over time. In one pilot-study interface pressures were measured on point B1 and C on patients with severe venous reflux in the great saphenous vein (CEAP C2-C5), during lying and standing (n=18). Three consecutive measurements were done: 1) the elastic bandage applied to the leg with a pressure of 20 mmHg, 2) the elastic bandage applied to the leg with a pressure of 30 mmHg and 3) after attaching the stiff patches to the elastic bandage. In a second pilot-study the pressure was measured on one healthy volunteer at B1, over seven days. Measurements were taken in supine, at dorsal flex and standing position, twice a day. The pressure-measuring device used was PicoPress® (by Microlab Italia).

Results

The elastic bandage provides a well-defined pressure, independent of placement or position. The patches add the stiffness to the underlying material and increase only the working pressure. With the patches, resting pressure is close to the same pressure as before, however working pressure increases significantly. As expected, there were a significant drop of working pressure in the evening day.

Correspondence: Josefin Damm, PressCise AB, Herrljunga, Sweden.
E-mail: josefin@presscise.com

Conflict of interest: two of the authors have commercial interest to declare. Josefin Damm and Torbjörn Lundh are co-inventors of the patches. The authors are also co-founders of the start-up company PressCise AB.

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Figure 1. Pressure measurements on B1, in supine (resting) and standing position with the bandage providing 20 mmHg and 30 mmHg (baseline) and pressure measurement in supine and standing position with the patches added over the bandage (patches). (n=18).

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each morning, however, maintained the working pressure level over seven days.

Conclusions

The presented device is of considerable practical interest in order to achieve a quantified compression treatment. It may also be especially essential for those patients who should have a low controlled resting pressure, as e.g. patients with mixed arterial venous disease and for whom hemodynamically active pressures are desirable as soon the patient is active. The easy way to maintain the pressure level over time may also be of great benefit for self-management.

References