A new compression pressure measuring device

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Introduction

The sine qua non of compression therapy is interface pressure yet it is rarely measured in the routine care of patients. In 2006, the first International Compression Club consensus on *an ideal sensor* to measure interface pressure was published.[1] In 2008, the International Union of Phlebology (IUP) published a consensus document stating the lack of interface pressure measurement was a knowledge gap in compression therapy.[2] The 2014 Society for Vascular Surgery and American Venous Forum (SVS-AVF) clinical guideline on venous ulcer care reiterated the lack of pressure measurement as a deficiency in the evidence to compression therapy.[3] Moreover, in the 2015 IUP response to the SVS-AVF guideline, targeted pressure ranges were recommended for specific disease state.[4] Yet interface pressure is seldom measured in routine ulcer care leaving most if not all compression therapy, arbitrary. After a decade from the initial call to action, manometer based devices such as PicoPress® (Microlab, Padua, Italy) and Kikuhime® (Meditrade, Soro, Denmark) are commercially available. Unfortunately, neither was widely adopted or used. The fact is the lack of this rudimentary information has raised concern from many healthcare and scientific entities including the Agency for Heathcare Research and Quality (AHRQ), the think-tank for U.S. healthcare policy. In the Jun 2016 AHRQ draft on Technology Assessment Report on Treatment Strategies for Patients with Lower Extremity Chronic Venous Disease, it clearly indicated two deficiencies related to compression therapy i) optimal pressure dosing and ii) duration of compression therapy. All existing and future interface pressure measuring devices will need to satisfy these two paucities.

Materials and Methods

From a technological stand-point, the mechanical properties of manometer, piezoresistive and capacitive based sensing characteristics are vastly different with pros and cons to each. In our work, a novel patented microfluidic capacitive (iontronic) sensor was developed, and was compared to the mechanical performance of PicoPress®[5] according to pressure cuff based cylinder model described previously by Partsch *et al.*[6]

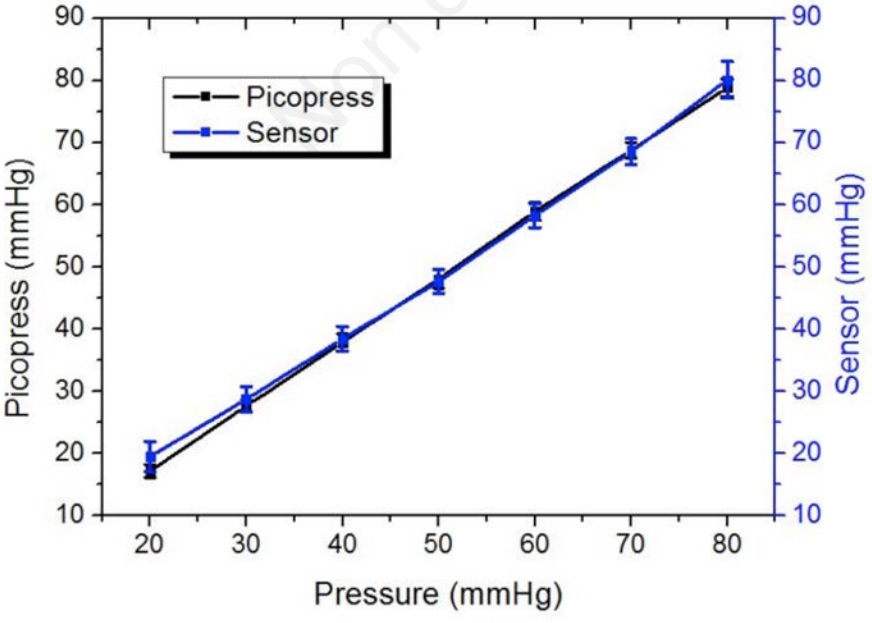

Figure 1. Iontronic sensor *versus* Picopress® performance characterization.

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Results

After 10,000 cycle runs, the iontronic sensor demonstrated stability in both mechanical response and repeatability. In sensing characterization, both the iontronic sensor and PicoPress® showed complete overlap of pressure graphs against the standard pressure cuff model, P>0.05 (Figure 1).[5] In other words, the 2 sensors had the same sensing performance or efficacy.

Conclusions

Manometer based interface pressure measuring devices are available but future device innovation should focus on accuracy, versatility, user-friendliness, wireless communication and data collection including compliance tracking to ensure seamless adoption by healthcare providers and patients.

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