Transdermal CO_2 Delivery with D`OXYVA Increases Skin Perfusion Pressure in Subjects with and without Diabetes

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Introduction

Medical gases have traditionally been administered via inhalation. However, the physiology of human skin makes it possible to deliver medical gases transdermally. D`OXYVA® (InvisiDerm) is a simple and commercially available device in the United States and other countries which can deliver CO_2 transdermally (Figure 1). Increasing CO_2 saturation in the periphery induces vasodilation through the Bohr effect, increasing perfusion.[1]

Methods

Subject were eligible to be enrolled if they were >18 years old, male or non-pregnant/nursing female and without significant peripheral artery disease. Subjects were excluded if there was an active ulceration, history of revascularization, or a previous complete or partial amputation on the index extremity. Transdermal CO_2 was delivered by D`OXYVA® (InvisiDerm) for 5 minutes in the thumb. Skin perfusion pressure (SPP) was measured with Sensilase® (Vasamed) in the hallux pre-treatment, and 5, 30, 60, 120, and 240 minutes post-treatment. Blood pressure and heart rate was measured at the same intervals. The study was approved by the Western Institutional Review Board.

Figure 1

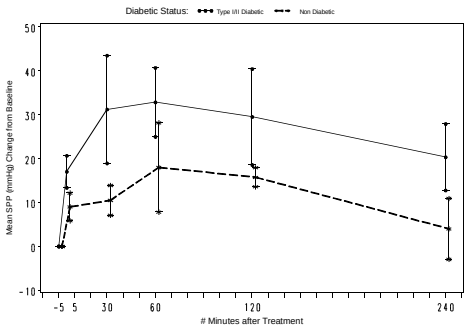

Figure 2

Results

A total of 14 subjects (6 with diabetes, 8 without diabetes) were enrolled. Comparisons between subjects with and without diabetes of the absolute change from pre-treatment for SPP were performed using the Mann-Whitney test. Figure 2 shows a graph of the change in SPP from baseline over the study period. Each post-treatment study through 4 hours showed a significant increase in the SPP. Systolic and diastolic blood pressures were also significantly reduced.

Conclusion

Although this was a small pilot study, a significant increase in a measure of microvascular perfusion was found with D`OXYVA®. There is much promise for a non-invasive, inexpensive device that improves circulation. Future study is required to determine the effect on disease states and complications, such as diabetic foot ulcers, peripheral artery disease, and Raynaud's disease.

References

1. Jensen FB. Red blood cell pH, the Bohr effect, and other oxygenation-linked phenomena in blood O_2 and CO_2 transport. Acta Physiol Scan 2004;182:215-217

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