

## **In Vitro Shockwave Treatment Influences Lymphatic Endothelial Cell Marker Expression and Proliferation**

Sabrina Riedl (1), Anna Weihs (2), Marion Groeger (3), Heinz Redl (1), Wolfgang Holnthoner (1)

**Institution:** (1) Ludwig Boltzmann Institute for Experimental and Clinical Traumatology, Vienna; (2) University of Applied Sciences Technikum Wien; (3) Skin and Endothelium Research Division, Department of Dermatology, Medical University of Vienna, Austria

**Device and producing company:** MTS Dermagold 100

### **Introduction:**

Shockwave treatment (SWT) holds promise in treating orthopaedic diseases and chronic wounds. Additionally, it has been shown to increase blood and lymphatic vessel densities. In this study we analyzed the effects of shock waves in lymphatic endothelial cells (LECs) in an in vitro setup.

### **Methods:**

LECs were stimulated using an in vitro experimental set-up with an unfocused shockwave device (dermagold100, MTS, Germany). Twenty four hours later, the cells were subjected to flow cytometry for endothelial marker expression. Moreover, 2D as well as 3D migration assays were employed. To analyze the effects of different extracellular matrices, cells were cultured either on fibronectin, collagen or uncoated surfaces.

### **Results:**

LECs reacted with varying proliferation rates when stimulated with different energies. In 2D- and 3D-migration assays LECs did not behave differently upon SWT treatment. The endothelial markers CD31, VE-Cadherin, VEGFR-2 as well as the LEC marker VEGFR-3 expression were not altered after SWT. However, we found an energy-dependent increase in expression of podoplanin, another marker for LECs. In addition, the extracellular matrix was shown to influence podoplanin expression and inducibility upon SWT.

### **Discussion:**

Regeneration of lymphatic vessels is of crucial interest for tissue engineering purposes or for lymphedema patients. SWT has been shown to stimulate the growth of new blood as well as lymphatic vessels. Our results add new insights into SWT-induced changes of LEC behavior and reveal podoplanin as one of the target molecules of SWT.

### **Conclusion:**

Shockwave treatment influences the proliferation of isolated lymphatic endothelial cells and up-regulates podoplanin in these cells.