How the fascial knowledge can change the application of the shock waves? from anatomy to clinical application

Fasciae are a new target of treatment in the rehabilitation medicine. In the past 15 years, multiple articles have demonstrated that they are very well innerved (more than muscles, tendons and joints) and that they can play a role as pain generator. Besides, fasciae are organized in multiple layers of fibrous and loose connective tissues. The different layers have different mechanical proprieties and answer to different physical inputs. Both the loose connective tissue, being rich in hyaluronan and water, and the fibrous tissue, are sensitive to mechanical inputs, such as extracorporeal shock wave therapy (ESWT). To better understand the biological effect of the ESWT into the fascial tissue, primary fascial fibroblasts were collected from small samples of human fascia lata of the thigh of three volunteer patients (two men, one woman) during orthopedic surgery, and put in culture. These cells were exposed to 100 impulses of 0.05 mJ/mm^2 with a frequency of 2.5 Hz, using 3D-printed support. This study demonstrated for the first time that ESWs can lead to in vitro production of hyaluronan-rich vesicles immediately after the treatment. At 1, 4, and 24 h after treatment, Alcian blue and Toluidine blue staining; immunocytochemistry to detect hyaluronic acid binding protein (HABP), collagen I, and collagen III; and transmission electron microscopy demonstrated that these vesicles are rich in hyaluronan and collagen I and III. The diameter of these vesicles was assessed, highlighting a small size at 1 h after ESW treatment, whereas at 4 and 24 h, they had an increase in the size. Particularly evident was the release of hyaluronan-rich vesicles, collagen-I, and collagen-III starting at 1 h, with an increase at 4 h and maintenance by 24 h. These in vitro data indicate that fascial cells respond to ESW treatment by regulating and remodeling the formation of extracellular matrix. So, the SW could be able to resolve a fascial densification, but it is important to know where to apply the probe. Indeed the fasciae create a continuity through the body, connecting different segments and explain referred pain. Consequently, if we'd like to apply SW to fasciae, it is important to change our the way to assess the patient, considering all these connections. The concept of myofascial unit will be introduced.