The electrical resistance of the deep fasciae of the human body

Carla Stecco[1], Guglielmo Frigo[2], Andrea Porzionato[1], Veronica Macchi[1], Luigino Benetazzo[2], Raffaele De Caro[1]

[1] Department of Human Anatomy and Physiology, Padova University, Padova, Italy
[2] Dept. of Information Engineering, Padova University, Italy

The fasciae are usually considered to be a passive element in the neuro-myofascial dynamics, but recent studies suggest that they may play a more active role in the peripheral control system and in the myofascial pain. Besides, some Authors suggest that the fasciae could have specific dielectric properties and for this reason different physical therapies use electrical stimulation in order to modify these proprieties. Really, in Literature a clear definition of the electrical properties of the deep fasciae still lack.

The aim of this study was to define the electrical resistance in different samples deep fasciae of the human body and to compare the value with those of the skin and of the underlying muscles.

In particular, we have analyzed 20 samples of the deep fascia (10 of crural fascia, 10 of brachial fascia), 5 samples of skin and 5 samples of muscle tissue. Each sample presented a regular form of 5x5 cm and were marked to recognize the orientation respect to the main axis of the limb. Each sample has been submitted to a sinusoidal electric signal with a frequency of 10 Hz and a fixed current of 1 mA in two direction: one along the main direction of the limb, one perpendicular.

This study showed that the resistance of the fasciae present constant features, in particular we have measured a mean resistance of 2200 Ohm along the main direction, and 2600 Ohm in the perpendicular one. The resistance decreases where the fascia is crossed by vessels or nerves (1500 Ohm). From an histological point of view, the less resistant direction corresponds to the principal direction of the collagen fibre bundles inside the fascia. The muscle present a less resistance (772 Ohm along the main direction, 812 Ohm in the perpendicular direction), while the skin presents very high values (200 kOhm and 264 kOhm, respectively).

From this study it is evident that the skin is almost insulating and the muscle the structure with the more transmittance, just as we expected. The new element is that also the fascia could transmit the electrical stimulation, and with different resistance according with the collagen fibre bundle organization.

So, it is probably that the "energetic" lines described in the human body, and that recently different studies have recognized inside the fascia, could be determined by the collagen fibre disposition inside the fascia. Besides, the points where different electrical instrumentations used in rehabilitation find a sudden decrease of the resistance, could be determined by an alteration of the collagen fibre disposition or by the interruption of these fibrous bundles caused by nerves or vessels inside the fascia.