Editorial

Fascia, the new frontier in anatomy

MAREK JANTOS

The journal Pelviperineology strives to bring the reader content at the forefront of research and clinical developments pertinent to the understanding of pelvic anatomy and function. This first issue for 2016 exemplifies this commitment. In past years, the journal has published several articles which emphasize the role of connective tissue in the genesis of chronic pelvic pain, bladder and bowel dysfunction. This issue introduces two original articles, which highlight the growing research interest in the fascia. Dr Carla Stecco and her collaborators share new and evolving insights into the continuity of the body's fascial system and its impact on the pelvic region. These articles provide further evidence supporting the "theory of a whole-body fascial linkage". Dr Stecco is an Orthopedic Surgeon and Professor of Human Anatomy and Movement Science at Padua University in Italy, and author of the new textbook on fascia, entitled *Functional Atlas of the Human Fascial System*.

Fascia has been labeled in Dr Stecco's text as the "*the forgotten structure"* in anatomy. This poorly understood organ, traditionally referred to as *"the fascia"* or the *"white packing stuff"* is rarely recognized for its important anatomical and functional role. Yet, the fascia is directly implicated in the etiology of pain, regulation of blood flow, dissipation of tensional forces between muscles, bones and joints, perception of movement and peripheral coordination of agonist, antagonist and synergic muscles. Furthermore, based on recent findings it's function as an extensive communication network links the body's anatomy to our sense of wellness and health.

The term *fascia*, whether used in the context of anatomy or classical architecture, derives from the same Latin root, meaning *band*, *bandage* or *binding*. These terms refer to the structural and functional properties of the fascia in holding things together, optimizing their presentation and enhancing the dynamics of local tissue and viscera. Thus, in modern anatomy the structure of the fascia is often described as a complex 3-D matrix of soft tissue, whose architecture challenges classical anatomical concepts and forms a new frontier in the study of human anatomy. This is well illustrated in the study of muscle tissue. Modern anatomy textbook colorfully illustrate muscle tissue in clear red colors (once the fascia is cut away), showing muscles as attaching to bones and functionally moving joints. Yet, as the work of Van de Wal and others has shown, no muscle ever attaches to bones anywhere in the body, without the investing structure of the connective tissue. Likewise no individual muscle moves bones without generating forces that are transmitted well beyond the local region. Many of these oversights need to be corrected.

Since the first International Research Congress held at the Harvard Medical School in 2007, it is evident that fascia is more than a malleable suit providing shape to our bodies, padding and insulation for confort and protection of organs. It is soft tissue, which defines each regional cavity of the body, supports and holds in place the total mass of the bodies' internal organs. The body's organs make up an estimated 12% of the total body's weight and are stabilized and held in place by fascial attachments to the side walls of the cavities that contain them. In the case of the abdominopelvic cavity, it is defined by the respiratory diaphragm, the psoas, transverse abdominis and pelvic muscles, with each muscle and organ not only invested in the fascia but precisely held in its optimal place by this connective tissue. Fascia perfectly holds the whole body together as an integral and functional entity. Other somatic structures, like the muscles, bones and joints, are also protected, embedded and lubricated by the fascia and its extracellular matrix. In addition the fascia also acts as the conduit for lymphatic and neurovascular bundles, which traverse its subcutaneous and deeper layers. As blood vessels and nerves cross the fascial planes, some crossing in a perpendicular fashion following the retinacula, others longitudinally in a very oblique course, all are affected by tension and restrictions in the fascia. Some of these restrictions may arise on account of surgical trauma, muscle generated tension, dehydration or emotional stress. Any such restrictions, resulting in fascial tension, can hypothetically choke the arteries embedded in the tissue and cause change in tissue color and potentially establish an ischemic state, giving rise to hyperalgesia. Likewise these changes in the fascia can lead to inflammatory states mediated by mast cell release of histamine, heparin and serotonin thus affecting the permeability of blood vessels and mediating the release of immunoglobulins.

As an organ of communication the fascia is regarded as the most important perceptual organ in the body. It is richly innervated with sensory receptors that enable exteroception, proprioception, nociception and interoception. The fascia possesses a ten times higher quantity of sensory receptors than muscle tissue. It is estimated that almost 80% of all the free nerve endings terminate in the fascia. Yet, 90% of these slow conducting C-fiber neurons follow different pathways to the brain than those involved in proprioception and are known as interoceptors. Functional imaging studies by Olausson and associates show that most of these C-fiber neurons specifically activate the insular cortex as opposed to the somatosensory cortex. Interoceptors are responsive to social and sensual touch and mediate emotional, hormonal and affiliative responses to physical contact. Human emotions and the sense of wellbeing are directly linked to stimulation of the interoceptors within the fascia.

As a complex organ system the fascia links every bodily structure and function by its continuous 3-D network. Without an appreciation of its important role in human anatomy, the assessment and management of various pathologies would be deficient. A good appreciation of the fascia, its composition, continuity and body-wide networking may hold vital secrets to our understanding of the successful functioning of the human body.

Correspondence to:
Marek Jantos
Behavioural Medicine Institute of Australia, &
Department of Human Anatomy, Medical University of Lublin, Poland
Section Editor Chronic Pelvic Pain
marekjantos@gmail.com