DELETERIOUS EFFECTS *OF AGEING*

ON MUSCLES, FASCIA AND NERVOUS SYSTEM

Ageing is a process associated with profound structural and functional changes in the body: the neuromuscular system undergoes extensive remodeling, involving muscles, fascia and central and peripheral nervous systems. The intrinsic characteristics of the tissues, as well as their functional and structural coupling, are affected and a decrease in overall physical performance occurs. The scientific literature shows that senescence is associated with **increased stiffness** and **reduced elasticity of fascia**, as well as loss of **skeletal muscle mass, strength and regenerative potential**. The interaction between muscle structures and fascia is also weakened.

The progressive loss of muscle mass during ageing, or **sarcopenia**, is detectable in the third decade of life and increases gradually with age. It is linked to a **30-50%** reduction in the number and **10-40%** in the **size of skeletal muscle fibers**, which is associated with a degradation in muscle performance. In particular, the reduction in skeletal muscle mass has been estimated at **0.37%** and **0.47%** per year for women and for men, respectively.

Clinical studies in the elderly have shown that muscle strength decreases faster than muscle mass. A **16.6** to **40.9%** reduction in muscle strength was estimated by comparing adults under 40 with adults over 40. The remodeling of skeletal muscles occurring with age also influences its mechanical properties with increased stiffness and decreased elasticity of various muscles (upper trapezius, sternomastoid, biceps brachii, rectus femoris). In addition, there is an alteration in **neuromuscular performance** with an increase in times to perform certain tasks in daily life (climbing stairs, getting up from a chair, walking a certain distance).

However, aged skeletal muscle still maintains a degree of **plasticity,** which is the potential of that tissue to alter its structural and functional characteristics in response to environmental changes.

REGULAR PHYSICAL ACTIVITY INDUCES AN INCREASE IN STRENGTH AND MASS THUS REDUCING THE DELETERIOUS EFFECT OF AGEING.

Besides its influence on the skeletal muscle, ageing also leads to changes in the **fascia** and **tendons.** Muscle fascia is composed of many molecules, such as structural proteins (collagens, laminins, fibronectin, tenascin and elastin), growth factors (TGF and IGF), glycosaminoglycans, proteoglycans, degradation enzymes (metalloproteinases), cytokines and water. The composition of those molecules changes during ageing.

Due to its structure and composition, fascia has elastic, viscoelastic and plastic properties which strongly influence the biomechanical characteristics of the locomotor system. Ageing is associated with a variation in fascia thickness which is specific to body sites: fascia thickness of the lower limb decreases with age up to -25.8%, while the fascia of the lower back area increases up to 76.7%. These changes would reduce the flexibility of the joints. Despite age-related changes in connective tissue, the effect of those changes on mechanical properties of tendons, such as strength, stiffness and elasticity, is still debated, due to conflicting data.

It must be underlined that muscles and fascia work together for the proper functioning of the locomotor system. Their intimate relationship makes the execution of the movement strictly dependent on the status of each of them. For example, during physical exercises, proper preparation of fascia by warming-up and stretching protocols is essential to optimize results and minimize risks of injury. The fascia is a key component of the muscle contractile system. It can modulate its composition and structure in response to biomechanical stimuli, thus allowing its adaptation over time to meet needs of the body.

Several studies have shown that muscles located in anatomically separate areas of the body can exchange tension constraints through close connection and cooperation with fascial structures, thus contributing to the achievement of movements. In the anatomical compartment between the leg and the trunk, that complex architecture has been described as a chain of myofascial force transmission.

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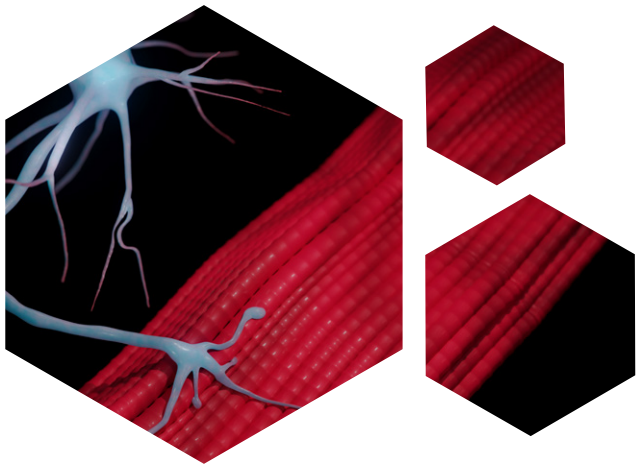

CONCERNING THE NERVOUS SYSTEM, AGEING LEADS TO AN ACCUMULATION OF DENERVATED MUSCLE FIBERS.

As a result, the amplitude of the force generated by the neuromuscular system, its transmission along the myofascial chain, joint mobility and coordination of movements are altered. Alterations in the structure and function of the nervous system contribute to a decrease in the skeletal muscle efficiency with age, through reduced motor coordination and muscle strength. The elderly have a **40% reduction in the total number of motor units.**

Over a lifetime, fascia can be damaged due to traumatic events, inappropriate physical activity or surgery. As a result, repair mechanisms are activated to restore the original structural and functional characteristics of the tissue. Alteration of that process can lead to musculoskeletal dysfunction and disorders. Thus, any strategies improving myofascial regeneration are essential. A wide range of tissue manipulation techniques have been proposed to improve fascial repair. It is important to mechanically stimulate the nerve and fascia. Approaches to modulate mechanoreceptor activity may be useful for functional recovery.

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WHAT MUST BE REMEMBERED

Ageing is associated with changes in cells, tissues and organs, leading to a progressive decline in physical performance. The musculoskeletal system loses its effectiveness due to molecular and cellular changes occurring in the fascia, the skeletal muscle tissue, the nervous system and their structural and functional coupling.

Genetics, epigenetics, environment, diseases, lifestyle, nutrition and injuries also play an important role in the tissue remodeling that occurs with ageing. Thanks to recent scientific progress, many of the phenomena and mechanisms associated with ageing have been defined, but there is still much to be studied left. Manipulative techniques can help to improve myofascial regeneration in the elderly. Physical activity has also been suggested as an effective strategy to counter the deleterious consequences of ageing.

In that context, LPG® techniques are the obvious choice for restoring stimulation and/or movement to connective tissue, fascia and the musculoskeletal system and slowing down the effects of ageing observed on these anatomical structures.

Movement is life! When movement is lacking, our tissues sometimes need a « a bit of a boost» to get back into motion. Ageing can be synonymous with stiffness, fibrosis, pain, so many moments when a helping hand is expected. When our cells lack information to function properly, endermologie® provides them with.

To remain active, mobile and independent, the Huber 360® Evolution is the ideal functional tool. With its various accessories (guardrails, specific seat, etc.), that cutting-edge technology offers a physical activity adapted and personalized to all. Huber 360® Evolution breaks down the patient journey into the 4 fundamental movements: flexibility and mobility, dynamic strengthening, posture and balance, resistance.

SOURCE:

Zullo A, Fleckenstein J, Schleip R, Hoppe K, Wearing S, Klingler W. Structural and Functional Changes in the Coupling of Fascial Tissue, Skeletal Muscle, and Nerves During Aging. Front Physiol. 2020 JUN 24;11:592. https://pubmed.ncbi.nlm.nih.gov/32670080/

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