Dynamic Chiropractic

SOFT TISSUE / TRIGGER POINTS

# Tenascin-C: Another Part of the Puzzle

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A major question in the world of soft tissue is, what is really happening when we touch people? Just rubbing someone's back or arm means much more than something that just feels good. Scientists refer to it as mechanical load. Our cells have the ability to detect the effect of mechanical load as to its tension, compression, shear, or fluid flow. Even the direction of tension affects certain mechanoreceptors more than others. For example, Pacini and Paciniform Type II receptors respond to rapid changes in pressure vibrations, while Ruffini Type II respond to sustained pressure and tangential forces.[1] It was found that fibroblasts in tendons synthesized large proteoglycans more easily when the tendon was compressed than when it was stretched. The environment that surrounds the cells in connective tissue is called the extracellular matrix (ECM). An important cell in the ECM is the fibroblast, which actually creates the ECM, i.e., its own environment. The ECM is made up of a hydrated polysaccharide gel that surrounds the collagen fibers, fibroblasts and other cells.

What is amazing to learn are the intricate interactions that occur between the cells and the surrounding ECM. Mechanical stress triggers connective tissue cells and the ECM by way of signaling receptors (integrins) which physically link ECM to the cell (cytoskeleton).[2] Interactions between the cells and ECM not only control the shape and orientation of cells, but can also directly regulate cellular functions, including migration, differentiation, proliferation, and the expression of different genes. These cell-matrix interactions have been elucidated in detail for several biological processes, especially morphogenesis and differentiation, but also play an important role during pathological situations, e.g., wound healing and tumor progression.[3] "The composition of ECM of musculoskeletal tissues appears to be controlled by the mechanical stresses placed on the cells within the connective tissue."[4]

So, what has all this to do with something called tenascin-C (TN-C)? Well, TN-C is one of many proteins found in the ECM and is regulated by mechanical loading. TN-C provides elasticity in mesenchymal tissues subjected to heavy tensile loading,[5] especially at the muscle-tendon junction. It possesses elastic properties capable of stretching to several times its resting length.[5] TN-C does not appear in normal skeletal muscle, except around the blood vessels within the muscle tissue, but it does appear at injury sites, especially where there are inflammatory cells and activated fibroblasts. Fibroblasts that increase due to mechanical load produce TN-C.

TN-C is an elastic protein and provides some elastic properties for the muscle-tendon unit,[5] which is mechanically the most vulnerable site for injury in the muscle-tendon unit. So, mechanical loading without injury cannot produce TN-C, but "disruption of the mechanical integrity of the tissue is required for the induction of the *de novo* synthesis of this protein."[5] Another possible function of TN-C is to simulate cell proliferation, possibly that of satellite cells; and help regenerating muscle cells attach to the ECM in a way that allows both growth of the muscle cells across the scar and their use before the regeneration is completed.[6]

It is accepted that an inflammatory response is needed to initiate a proper healing sequence, not only in the acute phase, but also possibly in the chronic inflammatory state. A problem with a chronic inflammation is that it never reaches the final stage of inflammation, known as the remodeling stage. Medicine has used dry needling over the quadriceps to initiate a vascular response to initiate healing, and it has been postulated that in a tendinosis, with its lack of inflammatory cells, cortisone is not as effective as the needle itself, since the mechanism of action may be related to the soft-tissue trauma and bleeding caused by the injection, acting as a stimulus for extrinsic healing of the tendon.[7]

It is apparent therefore that a soft-tissue technique such as deep-friction massage or an assisted soft-tissue method of mobilization such as Graston Technique® that is able to create an inflammation when necessary, is of added benefit to practitioners who use soft-tissue methods.

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