Quantification of hyaluronan in human fasciae and implication in myofascial pain and chondrosarcoma tumor invasiveness

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Introduction/Background: One key element of the extracellular matrix of fasciae is the hyaluronan (HA). It regulates the fascial movements, becoming consequently critical in the etiology of myofascial pain [1]. Recently, it has gained an important role in oncology because the composition of the peritumoral stroma, rich in extracellular matrix, is closely related to metastatic potential of the disease [2].

We have already demonstrated the existence of a new class of cells in fasciae, that we have termed fasciacytes, devoted to the production of the hyaluronan-rich matrix [3].

In this work we quantified the hyaluronan content of human fascial samples from a variety of anatomic sites. Then we compared the composition in HA with those of the peritumoral stroma of patients affected by chondrosarcoma, studying the fascia adjacent to the bone as containment structure of soft tissue tumors.

Methods: This study was approved by the Institutional Ethical Review Board and the institute’s ethical regulations were followed. We collected samples from 15 healthy volunteers and 11 patients with chondrosarcoma. HA was directly quantified by Purple-Jelley-HA assay, and indirectly investigated by the positivity of Hyaluronic-Acid-Binding-Protein. Finally, the expression of the hyaluronan-synthase HAS-2 has been evaluated by real-time RT-PCR.

Results: We demonstrated the presence of considerable levels of HA in human fascia with differences depending on the area: the amount was about 43 µg/g in the aponeurotic fasciae. Levels decreased drastically (6 µg/g) in epimysial fasciae, and increased in the retinacula (90.4 µg/g). These variations corresponded perfectly with the gliding functions of the fasciae. Surprisingly, no significant differences were detected as a function of age or sex.

In the oncological samples the HA increased in peritumoral stroma and tumor, with respect to the healthy fascia. The expression of HAS-2 decreased of about 50% in peritumoral and tumor tissue compared to the healthy one, suggesting an alteration in the HA turnover and synthesis.

Conclusions: This work will facilitate a better comprehension of the modulation of the hyaluronan-rich layer in relation to the various conditions that affect fascia. Furthermore, it may help in understanding the role of hyaluronan in influencing the aggressiveness of soft tissue tumors and the therapeutic response.

References:
2. Quail DF, Joyce JA. Microenvironmental regulation of tumor progression and metastasis. Nat Med,