Elastic fibers are composed of two distinct elements, elastin and microfibrils. Microfibrils are elastic cross-linked polymers mainly comprised of fibrillins and are present throughout elastic fiber elements including elaunin and oxytalan. In order to understand structure and functions of microfibrils, we developed the different extraction procedures of microfibrils from various tissues. Our new procedure using guanidine hydrochloride revealed new morphology of microfibrils. In contrast to collagenase extract microfibrils used for many years, fibrillin-1 filaments splayed out, extending beyond the width of the periodic globular beads. Guanidine extracted microfibrils containing all epitopes of our monoclonal antibodies to fibrillin-1.

Guanidine extracted microfibrils are functional element that are capable of binding to hyaluronan. That indicates versican, bound to microfibrils, can interact with HA, forming a macromolecular complex. Interestingly, in specific tissue like photo-aged skin and vitreous, the microfibrils lost HABR of versican and in unable to binds HA.

Another molecule that imparts distinct function to microfibrils is latent transforming growth factor-beta binding protein (LTBP) that covalently binds to transforming growth factor-beta (TGF-beta). We have found that the carboxyl terminal fragment of LTBP-1 interacts with fibrillin-1 and LTBP-1 localizes to fibrillin containing microfibrils. Furthermore, we have found that the amino-terminal region of LTBP-1 makes macro aggregates and alternative splicing of the region plays important role for activation of TGF-beta. Therefore, microfibrils can regulate TGF-beta activity through LTBP-1 fibrillin interaction. Indeed, genotype-phenotype correlation of Marfan syndrome (mutation in fibrillin-1) has been explained based on the impaired mechanical properties and deregulation of TGF-beta.

In granulation tissue in pressure ulcer, colocalization of fibrillin-1 and LTBP-1 is disturbed. Consistent with the observation, LTBP-1 fragment containing TGF-beta binding region is detected from wound surface of remodeling pressure ulcer. Extracellular regulation of TGF-beta activity may be important for wound healing.