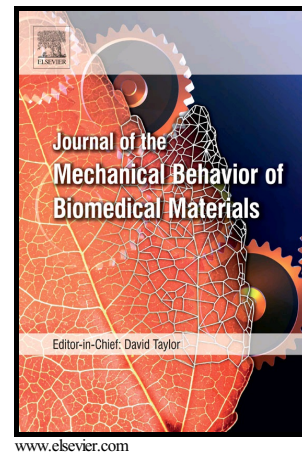


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A NON LINEAR-ELASTIC CONSTITUTIVE MODEL FOR SOFT CONNECTIVE TISSUE BASED ON A HISTOLOGIC DESCRIPTION: APPLICATION TO FEMALE PELVIC SOFT TISSUE

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To understand the mechanical behavior of soft tissues, two fields of science are essential: biomechanics and histology. Nonetheless, those two fields have not yet been studied together often enough to be unified by a comprehensive model. This study attempts to produce such model. Biomechanical uniaxial tension tests were performed on vaginal tissues from 7 patients undergoing surgery. In parallel, vaginal tissue from the same patients was histologically assessed to determine the elastic fiber ratio.

These observations demonstrated a relationship between the stiffness of tissue and its elastin content. To extend this study, a mechanical model, based on an histologic description, was developed to quantitatively correlate the mechanical behavior of vaginal tissue to its elastic fiber content. A satisfactory single-parameter model was developed assuming that the mechanical behavior of collagen and elastin was the same for all patients and that tissues are only composed of collagen and elastin. This single-parameter model showed good correlation with experimental results.

The single-parameter mechanical model described here, based on histological description, could be very useful in helping to understand and better describe soft tissues with a view to their characterization. The mechanical behavior of a tissue can thus be determined thanks to its elastin content without introducing too many unidentified parameters.

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