6th European Conference on Computational Mechanics (Solids, Structures and Coupled Problems) (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
June 11- 15, 2018, Glasgow, UK

MODELLING OF THE (MICRO-)STRUCTURAL COMPONENTS OF BIOLOGICAL CONNECTIVE TISSUES

MARLÈNE MENGONI[*], ALISON C. JONES[*] AND TOM SHEARER[†]

[*] Institute of Medical and Biological Engineering – University of Leeds
m.mengoni@leeds.ac.uk, a.c.jones@leeds.ac.uk, www.imbe.leeds.ac.uk

[†] School of Mathematics – University of Manchester
Tom.Shearer@manchester.ac.uk, http://www.maths.manchester.ac.uk/~tshearer/

Key words: Fibrous connective tissues, microstructure, elasticity, computational modelling

ABSTRACT

Considerable progress has been made in the past decade on the ability to model biological fibrous and cartilaginous connective tissues, accounting for their diverse mechanical behaviour. However, the link between the tissue composition, in terms of the hierarchical arrangement of their solid components, and their mechanical behaviour is not always clear in many models; and reverse-engineering of models to experiments on soft tissues is complex given the difference between in situ, in vivo and in vitro behaviour [1].

New techniques and constitutive models are emerging that link macroscopic parameters to the microstructure of the tissue under consideration [2] or that assess the variability of directly measurable parameters to reduce the number of unknowns in a reverse-engineering approach [3]. This minisymposium welcomes abstracts dealing with modelling and characterisation of fibrous and cartilaginous connective tissues, and particularly welcomes the following topics:

- Advances in elastic constitutive modelling based on tissue microstructure
- Advances in continuum damage constitutive modelling based on microstructural damage
- Multi-scale modelling techniques
- Applications focusing on population variation
- Reverse-engineering methods applied to fibrous tissue structure
- Approaches focussing on the differences between in vivo, in situ and in vitro behaviour

REFERENCES

[1] Bint-E-Siddiq A., Wijayathunga V.N., Mengoni M., Jones A.C. & Wilcox R.K. Characterisation and Comparison of Human and Ovine Spinal Ligaments. Proceedings of the ORS, Journal of Orthopaedic Research, v 35, S1 (2017)

[2] Shearer, T. A new strain energy function for modelling ligaments and tendons whose fascicles have a helical arrangement of fibrils. Journal of Biomechanics 48, 3017–3025, (2015)

[3] Mengoni M., Luxmoore B.J., Jones A.C., Wijayathunga V.N., Broom N.D. & Wilcox R.K. Derivation of inter-lamellar behaviour of the intervertebral disc annulus. Journal of the Mechanical Behavior of Biomedical Material, v 48, 164–172 (2015)