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On the active response of soft living tissues. (English) Zbl 1115.74349
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Summary: Soft tissues exhibit a nonlinear, essentially incompressible (visco-) elastic response; a key issue is the active nature of muscle fibres, in other words their ability to contract and relax in response to biochemical signals. Here we present a continuum model able to describe an active elastic medium.

MSC:

74L15 Biomechanical solid mechanics
92C10 Biomechanics

Cited in **24** Documents

Keywords:

Active deformations; Soft tissues; Finite elasticity

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References:

- [1] Fung, Y.C.: *Biomechanics: Mechanical Properties of Living Tissues*. 2nd edn. Springer, New York (1993)
- [2] Humphrey, J.D.: *Cardiovascular Solid Mechanics. Cells, Tissues, and Organs*. Springer, New York (2002)
- [3] Hayashi, K.: Mechanical properties of soft tissues and arterial walls. In: Holzapfel, G.A., Ogden, R.W. (eds.) *Biomechanics of Soft Tissues in Cardiovascular Systems*. Cism Courses and Lectures, no. 441, pp. 15–64. Springer, Berlin Heidelberg New York (2003) · [Zbl 1039.92005](#)
- [4] Pelce, P., Sun, J.: A simple model for excitation-contraction coupling in the heart. *Chaos Solitons Fractals* 5, 383–391 (1995) · [Zbl 0925.92052](#) · [doi:10.1016/0960-0779\(93\)E0030-F](#)
- [5] Negroni, J.A., Lascano, E.L.: A cardiac muscle model relating sarcomere dynamics to calcium kinetics. *J. Mol. Cell. Cardiol.* 28, 915–929 (1996) · [doi:10.1006/jmcc.1996.0086](#)
- [6] Chudin, E., Garfinkel, A., Weiss, J., Karplus, W., Kogan, B.: Wave propagation in cardiac tissue and effects of intracellular calcium dynamics (computer simulation study). *Prog. Biophys. Mol. Biol.* 69, 225–236 (1998) · [doi:10.1016/S0079-6107\(98\)00009-1](#)
- [7] Okada, J., Sugiura, S., Nishimura, S., Hisada, T.: Three-dimensional simulation of calcium waves and contraction in cardiomyocytes using the finite element method. *Am. J. Physiol., Cell Physiol.* 288, C510–C522 (2005) · [doi:10.1152/ajpcell.00261.2004](#)
- [8] Nash, M.P., Hunter, P.J.: Computational mechanics of the heart. *J. Elast.* 61, 113–141 (2000). · [Zbl 1071.74659](#) · [doi:10.1023/A:1011084330767](#)
- [9] Usyk, T.P., Mazhari, R., McCulloch, A.D.: Effect of laminar orthotropic myofiber architecture on regional stress and strain in the canine left ventricle. *J. Elast.* 61, 143–164 (2000) · [Zbl 0974.92002](#) · [doi:10.1023/A:1010883920374](#)
- [10] Nash, M.P., Panfilov, A.V.: Electromechanical model of excitable tissue to study reentrant cardiac arrhythmias. *Prog. Biophys. Mol. Biol.* 85, 501–522 (2004) · [doi:10.1016/j.pbiomolbio.2004.01.016](#)
- [11] Panfilov, A.V., Keldermann, R.H., Nash, M.P.: Self-organized pacemakers in a coupled reaction-diffusion-mechanics system. *Phys. Rev. Lett.* 95, 258104-1–258104-4 (2005) · [doi:10.1103/PhysRevLett.95.258104](#)
- [12] Rachev, A., Hayashi, K.: Theoretical study of the effects of vascular smooth muscle contraction on strain and stress distribution in arteries. *Ann. Biomed. Eng.* 27, 459–468 (1999) · [doi:10.1114/1.191](#)
- [13] Humphrey, J.D., Wilson, E.: A potential role of smooth muscle tone in early hypertension: a theoretical study. *J. Biomech.* 36, 1595–1601 (2003) · [doi:10.1016/S0021-9290\(03\)00178-7](#)
- [14] Cherubini, C., Filippi, S., Nardinocchi, P., Teresi, L.: *Electromechanical modeling of excitable tissues*. (2007) (forthcoming)
- [15] Sachse, F.B.: *Computational Cardiology*. Springer, Berlin Heidelberg New York (2004) · [Zbl 1051.92025](#)
- [16] Holzapfel, G.A., Gasser, T., Ogden, R.W.: A new constitutive framework for arterial wall mechanics and a comparative study of material models. *J. Elast.* 61(1), 1–48 (2000) · [Zbl 1023.74033](#) · [doi:10.1023/A:1010835316564](#)
- [17] Rivlin, R.S.: Stability of pure homogeneous deformations of an elastic cube under dead loading. *Quarterly Appl. Math.* 32(3), 265–271 (1974) · [Zbl 0324.73039](#)
- [18] Beatty, M.F.: Topics in finite elasticity: hyperelasticity of rubber, elastomers, and biological tissues – with examples. *Appl. Mech. Rev.* 40(12), 1699–1734 (1987) · [doi:10.1115/1.3149545](#)
- [19] DiCarlo, A., Quilgotti, S.: Growth & remodeling. *Mech. Res. Commun.* 29, 449–456 (2002) · [Zbl 1056.74005](#) · [doi:10.1016/S0093-6413\(02\)00297-5](#)

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