

1. Record Nr.	UNINA9911019672203321
Autore	Laurent Cedric
Titolo	Mechanics of Living Tissues : Imaging, Characterization and Modeling Towards the Study of Soft Tissues
Pubbl/distr/stampa	Newark : , : John Wiley & Sons, Incorporated, , 2024 ©2024
ISBN	9781394306596 1394306598 9781394306572 1394306571
Edizione	[1st ed.]
Descrizione fisica	1 online resource (344 pages)
Collana	ISTE Invoiced Series
Altri autori (Persone)	VerdierClaude
Disciplina	571.5
Soggetti	Biomechanics Tissues
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Cover -- Title Page -- Copyright Page -- Contents -- Preface -- Introduction: Mechanics of Living Tissues: Applications, Challenges and Methods -- Chapter 1. Biomechanics of the Liver: Characterizations, Modeling and Clinical Applications -- 1.1. Anatomy and clinical issues -- 1.1.1. Detailed anatomy -- 1.1.2. Main pathologies of the liver -- 1.1.3. Main applications of liver biomechanics -- 1.2. Experimental biomechanical characterizations -- 1.2.1. Characterizations of hepatic parenchyma -- 1.2.2. Influence of the vascular system on the mechanical response -- 1.2.3. Influence of the capsule on the mechanical response -- 1.3. Elastography for the diagnosis of fibrosis, cirrhosis, inflammation and liver tumors -- 1.3.1. Ultrasonic elastography -- 1.3.2. Magnetic resonance elastography -- 1.4. Mechanical modeling -- 1.4.1. Geometry and boundary conditions -- 1.4.2. Constitutive mechanical laws -- 1.5. Conclusion and outlook -- 1.6. Acknowledgments -- 1.7. References -- Chapter 2. Biomechanics of the Skin: Characterizations, Modeling and Scalp Applications -- 2.1. Anatomy and properties of the skin -- 2.1.1. Anatomy and microstructure -- 2.1.2. Mechanical properties -- 2.2. Characterization

of the mechanical properties of the skin -- 2.2.1. Ex vivo characterization -- 2.2.2. In vivo characterization -- 2.3. Imaging of the skin -- 2.4. Modeling the mechanical behavior of the skin -- 2.5. A special case: the scalp -- 2.5.1. Anatomy and specificities of the scalp -- 2.5.2. Towards computational simulation of scalp behavior -- 2.6. References -- Chapter 3. Biomechanics of the Cornea -- 3.1. Anatomy and clinical problems -- 3.2. Experimental characterization -- 3.2.1. Imaging -- 3.2.2. Mechanical characterization -- 3.3. Modeling mechanical behavior -- 3.4. Biomaterials -- 3.5. Acknowledgements -- 3.6. References.

Chapter 4. Biomechanical Modeling of the Human Tongue -- 4.1. Introduction -- 4.2. Anatomy of the tongue: environment, topology and partitioning -- 4.3. State of the art on biomechanical modeling of the human tongue -- 4.4. Our 3D FE model of the human tongue -- 4.4.1. Geometry and mesh -- 4.4.2. Constitutive laws -- 4.4.3. Boundary conditions -- 4.5. Numerical simulations -- 4.5.1. Transient simulations -- 4.5.2. Temporal activations of tongue muscles -- 4.5.3. Tongue displacements -- 4.5.4. Tongue trajectories -- 4.6. Discussion -- 4.7. Perspective: model order reduction for real-time simulation -- 4.8. Conclusion -- 4.9. References -- Chapter 5. Biomechanical Characterization of the Disc of the Temporomandibular Joint -- 5.1. Anatomical and geometric description of the temporomandibular joint and its discs -- 5.1.1. The temporomandibular joint -- 5.1.2. The temporomandibular joint disc -- 5.2. Biomechanics of the temporomandibular joint disc -- 5.2.1. Biomechanical tests on the temporomandibular joint disc -- 5.2.2. Simulation of the temporomandibular joint -- 5.3. Perspectives on the study of the temporomandibular joint disc -- 5.4. References -- Chapter 6. Biomechanics of the Intervertebral Disc -- 6.1. Introduction -- 6.2. Anatomy of the spine, disc and clinical issues -- 6.2.1. Anatomy of the spine -- 6.2.2. Disc anatomy and clinical issues -- 6.2.3. Discussion of some clinical issues -- 6.2.4. Structural mechanical properties of the IVD -- 6.2.5. Transport properties of the IVD -- 6.3. IVD modeling -- 6.4. IVD and therapeutic strategies -- 6.5. Conclusion and outlook -- 6.6. References -- Chapter 7. Biomechanics of the Anterior Cruciate Ligament (ACL) -- 7.1. Introduction: ACL physiology and pathologies -- 7.1.1. Anatomy and microstructure -- 7.1.2. Function of the ACL -- 7.1.3. Clinical issues -- 7.2. Mechanical characterization of the ACL. 7.2.1. Ex vivo characterization of the mechanical properties of the ACL -- 7.2.2. Definitions of physiological stresses -- 7.3. Biomechanical modeling of the ACL -- 7.3.1. Constitutive laws -- 7.3.2. Integration into computational simulations -- 7.4. Toward tissue engineering of the ACL -- 7.4.1. Specifications and challenges -- 7.4.2. State of the art -- 7.4.3. Example of a solution from a computational approach -- 7.4.4. Toward the engineering of a bone-ACL-bone complex -- 7.5. References -- Chapter 8. Mechanoregulation in Soft Biological Tissues: Application to the Development of Arterial Calcifications -- 8.1. Introduction -- 8.1.1. Abbreviations -- 8.1.2. Context -- 8.1.3. Wall structure in large elastic arteries -- 8.1.4. Wall mechanics in large elastic arteries -- 8.2. Mechanoregulation of arteries -- 8.2.1. The mechanostat -- 8.2.2. Mechanotransduction by arterial cells -- 8.2.3. Vascular mechanosome -- 8.2.4. Mechanically regulated molecules controlling vascular remodeling -- 8.3. Biochemistry of MAC -- 8.3.1. Mechanisms of MAC -- 8.3.2. MAC: a disruption of the mechanostat? -- 8.3.3. Perspectives on systems biology modeling of MAC in CKD-MBD -- 8.4. Conclusion -- 8.5. References -- Chapter 9. Biomechanics of Bone Tissue and Its Interactions with Surrounding Tissues -- 9.1. Introduction -- 9.2. Anatomy and physiology of bone from the

macroscopic to the molecular scale -- 9.2.1. The human skeleton -- 9.2.2. Cortical bone and cancellous bones -- 9.2.3. Microstructure of the cortical and cancellous bones -- 9.2.4. Bone cells and their functions -- 9.2.5. Bone at the molecular level -- 9.3. Bone tissue imaging and key morphological features -- 9.4. Mechanical behavior of bone and characterization methods -- 9.4.1. Storage, temperature, hydration: key factors for measuring the mechanical properties of biological tissues.

9.4.2. Characterization of bone structures at the macroscopic scale: accessible mechanical data and implemented methodologies -- 9.4.3. Anisotropic linear elastic behavior of bone tissue -- 9.4.4.

Viscoelasticity of bone tissue -- 9.4.5. Bone tissue damage and rupture mechanics -- 9.5. Interactions of bone tissue with surrounding tissues, and clinical implications -- 9.5.1. Bone marrow interface: involvement in osteoporosis and bone tumors -- 9.5.2. Subchondral bone: a major player in the evolution of osteoarthritis -- 9.6. Conclusion and outlook -- 9.7. References -- Conclusion -- List of Authors -- Index.

Sommario/riassunto

The book 'Mechanics of Living Tissues' explores the biomechanical properties and modeling of various soft tissues in the human body, including the liver, skin, cornea, and tongue. It addresses the anatomy, clinical issues, and mechanical characteristics of these tissues, emphasizing the importance of imaging and modeling techniques. The work, coordinated by Cédric Laurent and Claude Verdier, aims to advance the understanding of biomechanics for clinical applications, focusing on diagnostics and therapy. Intended for researchers, clinicians, and students in biomechanics and medical technology, the book offers insights into tissue behavior and modeling, contributing to medical diagnostics and therapeutic strategies.
