<<皮肤热力学与皮肤热疼痛>>

图书基本信息

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前言

Advances in laser, microwave and similar technologies in medicine haveled to recent developments of thermal treatments for disease and injury,involving skin tissue. In spite of the widespread use of thermal therapiesin dermatology, they do not draw upon the detailed understanding of the biothermomechanical-neurophysiological behaviour, for none exists to date,even though each behavioural facet is somewhat established and understood.In view of this dilemma, a new research area emerges, which is the subject ofthis book: "Introduction to Skin Biothermomechanics and Thermal Pain".This area is highly interdisciplinary, involving the subjects of engineering,biology and neurophysiology. This book is focused on the introduction ofthis new research area. According to the schematic relationship between theareas involved, this book is divided into four parts: PART I. Skin bioheattransfer and thermal damage; PART II. Skin biomechanics; PART III. Skinbiothermomechanics; PART IV. Skin thermal pain.

内容概要

Introduction to Skin Biothermomechanics and Thermal Pain introduces the study of coupled bio-thermo-mechanical and neural behavior of skin tissue in response to thermal and mechanical loads. The research in this book focuses on the theoretical modeling and experimental investigation of heated skin tissue in order to provide a predictive framework for thermal therapies of diseased tissue in clinics. Furthermore, by developing solution tools, it focuses on changes in treatment parameters leading to more effective therapies. The book is intended for researchers and scientists in Bioengineering,Heat Transfer, Mechanics, Biology and Neurophysiology, as well as clinicians.

书籍目录

章节摘录

However, classical grips which apply a pressure on the sample ends lead toa slippage of the sample if the pressure is too low, or damage of the samplenear the grips if the pressure is too high[147]. Gluing the samples to thegrip can be successfully done for very thin samples. However, if samples aretoo thick there is shear between the fixed sample sides and the sample core,giving a complex pattern of strain in this region[159] and the inner fibers of thesample are less strained than the fibers at the surface. Despite the reducedslippage or failure of connective tissue at the clamping site, a non-uniformloading pattern may occur, with uneven fiber recruitment of the tissue undertension and the constraint on the extracellular fibers at the bounds ofthe sample is induced[149], which will result in low measurement precisionand non-repeatability[146].SutureDue to the drawbacks of clamping described above, many researches haveused suture[161], where a specimen is attached to loading assemblies by severalcontinuous loops of medical suture per edge since using thin threads allowsthe free expanding of sample edges in the lateral direction[13], as shown inFigure 6.3. However, suturing sample edges might result in a discontinuousload transfer to the underlying fibrous network since only discrete groups offibers within the vicinity of the suture attachment point are loaded[149].Waldman & Lee[149] compared the dynamic biaxial mechanical responseof soft biological tissue samples under suturing and clamping under the sameconditions. It was found that the tissue samples appeared to be stiffer and lessextensible when mechanically tested with clamped sample edges, as opposedto when tested with sutured sample edges; and suture attachment methodsdemonstrated minimal boundary effects where four suture attachments aresufficien~ to obtain uniform stress field in biaxial testing. The same resultshave also been obtained by Sun et al.[140]1, who found that there were strongboundary effects with the clamped methods, which resulted in the fact thatthe inner region was not fully loaded and therefore not fully stretched andmakes the tissue appear to be substantially stiffer.

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