

199c In Vivo Monitoring of Tissue Mechanical Properties during Wound Healing

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The cellular response to the placement of a foreign substance, particularly silicone, into the soft tissues has been fairly well characterized histologically. The eventual replacement of a cellular phenomenon with fibroblast infiltration around the implant, followed by compact collagen deposition (the capsule) has been clearly documented. However, histological evaluation cannot distinguish the degree to which the collagen envelope contracts later in the wound repair process. This contraction can cause firmness, distortion, and migration of the implant, leading to poor clinical outcomes. A combination of two implantable sensors has been employed to monitor the effects of both inflammation and collagen contraction on the viscoelasticity, firmness, and contractile force surrounding the implant. Animal model results indicate that the piezoacoustic sensor responds significantly to early stages of inflammation and modestly to capsule maturation. The piezoresistive sensor responds significantly to the later contractile event. These sensors could lead to animal models that screen contraction intervention methods.