The tissue diagnostic instrument

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Abstract:

Tissuemechanical properties reflect extracellular matrix composition and organization, and as such, their changes can be a signature of disease. Examples of such diseases include intervertebral disk degeneration, cancer, atherosclerosis, osteoarthritis, osteoporosis, and tooth decay. Here we introduce the tissue diagnostic instrument (TDI), a device designed to probe the mechanical properties of normal and diseased soft and hard tissues not only in the laboratory but also in patients. The TDI can distinguish between the nucleus and the annulus of spinal disks, between young and degenerated cartilage, and between normal and cancerous mammary glands. It can quantify the elastic modulus and hardness of the wet dentin left in a cavity after excavation. It can perform an indentation test of bone tissue, quantifying the indentation depth increase and other mechanical parameters. With local anesthesia and disposable, sterile, probe assemblies, there has been neither pain nor complications in tests on patients. We anticipate that this unique device will facilitate research on many tissue systems in living organisms, including plants, leading to new insights into disease mechanisms and methods for their early detection.

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