

论文

椎弓根钉植入针道上骨组织光谱特性研究

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摘要:

运用光谱技术研究了椎骨组织不同位置的特征识别因子.光谱采集系统由双光纤手钻一体式探头(光纤芯径200 μm , 中心距离0.5 mm)、卤素光源(波长360~2 000 nm)、光纤光谱仪(检测波长为200~1 100 nm)和计算机组成,可以同时获得生物组织的漫反射光谱和约化散射系数.以猪椎骨为实验对象,测量椎弓根螺钉植入针道上不同骨组织的漫反射光谱和约化散射系数,并对光谱进行特定波长的峰值、面积、斜率分析,获得特性识别因子.研究发现,椎弓根钉植入针道上不同骨组织的光谱表现出不同的变化特性.其中峰值的变化比约化散射系数的变化高1.88倍,面积的变化比约化散射系数的变化高2.05倍.在495~505 nm处,骨密质和骨疏质的光谱斜率都为正值;在520~535 nm处,骨密质光谱的斜率为正值,而骨疏质光谱的斜率为负值.结果表明,通过光谱特性分析获得的峰值、面积和斜率因子能够有效地区分针道上骨密质与骨疏质的差异.

关键词: 椎弓根 光谱 骨组织 特征识别因子

Spectrum's Characteristics of Bone Tissues on Pedicle Screw Placement Pathway

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Abstract:

The characteristic identification factor of the vertebra at different positions was studied by spectroscopic technology. The spectral measurement system consists of computer, the integrated hand drill with dual-fiber probe (each fiber's core diameter is 200 μm and the distance between the center of two fibers is 0.5 mm), halogen light source (wavelength is from 360 nm to 2 000 nm) and fiber optic spectrometer (detection wavelength: 200~1 100 nm). The diffuse reflectance spectrum and the reduced scattering coefficient of biological tissue could be obtained at the same time. Pig's vertebra was chosen as experimental subject to measure the diffuse reflectance spectrum and scattering coefficient of different bone tissue on pedicle screw placement pathway. The characteristic identification factor was defined by analyzing the peak values, the size of the area and the slope of the spectrum in specific wavelength. We find that different bone tissue's spectrums show different characteristics. The change of the peak values was 1.77 and the change of the area values was 2.13 times higher than that of scattering coefficient, respectively. At the range of 495 nm to 505 nm, the slope of spectrum of cortical bone and cancellous bone was positive. At the range of 520~535 nm, the slope of spectrum of cortical bone was positive, and the slope of cancellous bone was negative. It can be concluded that the peak value, the area and the slope obtained by analysis of spectrum's characteristics could distinguish the difference between cortical bone and cancellous bone.

Keywords: Pedicle of vertebra Spectrum Bone tissue Characteristic identification factor

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