



E49

Estimation Of Fibrosis And Steatosis Of The Liver Using Electrochemical Impedance Spectroscopy On A Needle

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Background: To avoid post-hepatectomy liver failure, a thorough evaluation of liver function and volume is mandatory. This study aimed to evaluate the value of electrochemical impedance spectroscopy in diagnosing hepatic fibrosis and steatosis.

Methods : Electrochemical impedance spectroscopy on a needle was designed to measure tissue impedance. The electrical impedances for nine resected liver parenchyma were measured in the frequency range of 100 Hz to 1 Mhz. The electrical impedances were analyzed and compared in terms of the pathologic grade of fibrosis and steatosis.

Results : Specimens with a higher fibrosis grade showed a significantly higher impedance value. The fibrosis grade was significantly correlated with a real part of the impedance in all current frequency ranges. The highest correlation coefficient was observed at a current frequency of 1 MHz (P < 0.001, R = 0.671, R2 = 0.450). The highest correlation between macrosteatosis and the real part of impedance was observed at a current frequency of 100 Hz (P < 0.001, R = -0.768, R2 = 0.589).

Conclusions : The electrical impedance of liver parenchyma was significantly correlated to fibrosis and steatosis. This study showed the possibility of preoperative quantification of hepatic fibrosis and steatosis using electrochemical impedance spectroscopy on a needle.

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