عنوان مقاله:

Evaluation of Soft Tissue Sarcoma Tumors Electrical Conductivity Anisotropy Using Diffusion Tensor Imaging for Numerical Modeling on Electroporation

محل انتشار:

مجله فیزیک و مهندسی پزشکی, دوره 6, شماره 2 (سال: 1395)

تعداد صفحات اصل مقاله: 10

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خلاصه مقاله:

Introduction: There is many ways to assessing the electrical conductivity anisotropyof a tumor. Applying the values of tissue electrical conductivity anisotropyis crucial in numerical modeling of the electric and thermal field distribution in electroporationtreatments. This study aims to calculate the tissues electrical conductivityanisotropy in patients with sarcoma tumors using diffusion tensor imaging technique.Materials and Method: A total of ۳ subjects were involved in this study. Allof patients had clinically apparent sarcoma tumors at the extremities. The T۱, T۲ andDTI images were performed using a ۳-Tesla multi-coil, multi-channel MRI system.The fractional anisotropy (FA) maps were performed using the FSL (FMRI softwarelibrary) software regarding the DTI images. The ۳D matrix of the FA maps of each area(tumor, normal soft tissue and bone/s) was reconstructed and the anisotropy matrixwas calculated regarding to the FA values.Result: The mean FA values in direction of main axis in sarcoma tumors wereranged between ۰.۴۷۵â €“۰.۶۹۰. With assumption of isotropy of the electrical conductivity,the FA value of electrical conductivity at each X, Y and Z coordinate axes wouldbe equal to ۰.۵۷۷. The gathered results showed that there is a mean error band of ۲۰%in electrical conductivity, if the electrical conductivity anisotropy not concluded at thecalculations. The comparison of FA values showed that there is a significant statisticaldifference between the mean FA value of tumor and normal soft tissues (P<۰.۰۵).Conclusion: DTI is a feasible technique for the assessment of electrical conductivityanisotropy of tissues. It is crucial to quantify the electrical conductivity anisotropydata of tissues for numerical modeling of electroporation treatments.

کلمات کلیدی:

Diffusion tensor imaging, Electrical conductivity, Anisotropy, Sarcoma tumors