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EVALUATION OF LONGITUDINAL RELAXATION TIME (T_1) OF BONE MARROW IN LUMBAR VERTEBRAE OF LEUKAEMIA PATIENTS UNDERGOING MAGNETIC RESONANCE IMAGING

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Quantitative determination and analysis of relaxation times enable development of novel imaging protocols and may be useful in characterization and long term follow up of pathological conditions using Magnetic Resonance Imaging (MRI). Longitudinal Relaxation Times (T_1) measurements in musculoskeletal tissue have been utilized in several previous studies as a prognostic indicator. Acute Myeloid Leukaemia (AML) which is characterized by abnormal increase of immature leukocytes is recognized as a biologically heterogeneous disease. With respect to the diagnosis of AML, only a few prognostic markers have been identified all of which need invasive procedures. The aim of this study was to measure and evaluate the T_1 in bone marrow of a Leukaemia patient in order to explore the potential for a prognostic biomarker using MRI which will be a non invasive prognostic approach to AML. The study data of this prospective study were collaboratively obtained using MR images of adult patients diagnosed of AML undergoing routine MRI prior to standard induction chemotherapy at the Oregon Health & Science University (OHSU), Oregon State, USA. MR image data was collected in the DICOM format and MATLAB Simulink (The Mathworks. Natick, MA, USA) software was used in the image processing and data analysis. For quantitative MRI data analysis, Region of Interest (ROIs) on multiple image slices were drawn encompassing vertebral bodies of L3, L4 and L5. T_1 was calculated based on a theoretical expression of variable flip angle SPGR signal intensity at steady state. T_1 maps within ROIs of L3, L4, and L5 were obtained. According to the obtained T_1 colour maps T_1 value varied from ~ 500 to ~ 1000 (ms). The histogram analysis revealed that the mean T_1 values of L3, L4, and L5 as 682.9ms, 839.4ms and 848.2ms, respectively. The estimated overall bone marrow mean value of T_1 is 790.1 (ms) at 3T. However, the reported T_1 value of healthy subjects is significantly (946.0 ms) higher than the present finding. This suggests that the T_1 for bone marrow can be considered as a potential prognostic biomarker for AML patients. Active enrolment of more subjects for this study is currently ongoing to validate the preliminary results.