

Longitudinal relaxation time analysis of pixel based magnetic resonance imaging parameter for potential acute myeloid leukemia identification

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Acute Myeloid Leukemia (AML) is the second most common hematological tumor around worldwide. Increased activity in bone marrow (BM) in AML patients has been observed over past decades. In this regard, BM magnetic resonance imaging (MRI) enters the arena of non-invasive imaging and become an important imaging modality. Using MRI quantitative determination and analysis of relaxation times enable buildup of novel imaging protocols. Longitudinal Relaxation Times (T1) measurements have been utilized in different previous studies as a prognostic indicator. Therefore, the purpose of our prospective study was to introduce the T1 as a potential *non-invasive* bio-marker for identification of AML patients.

Data for the study was collaboratively obtained using MR images of five adult subjects who have been AML diagnosed at the Oregon Health & Science University, United States of America. A 3D RF (Radio Frequency)-spoiled gradient-echo (SPGR) sequence has been used to acquire coronal T1W-MRI data with variable flip angles (VFA). MATLAB Simulink image processing software was used for the data analysis. T1 values were estimated in pixel by pixel basis within the ROI's (Region of Interest) drawn in L2, L3 and L4 lumbar vertebrae on the BM regions in the coronal sections of all five subjects.

The histogram analysis for L2, L3 and L4 in five subjects reveals mean T1 values of 727ms, 784ms and 780ms respectively. Estimated overall mean T1 value within those lumbar vertebrae for all five subjects was 762ms.

As reported by Jensen *et al.*, the T1 value of normal subjects is within the 320-602ms. According to our study findings T1 value for diagnosed AML patients carry a considerably high value. The study used only two selected flip angles (FA) and BM data only from L2, L3 and L4. If the number of FA and regions for BM data were increased, uncertainty which can occur due to FA and errors due to area selections can be reduced respectively.

Therefore, this study suggests that T1 of AML patients in BM could potentially be introduced as a diagnostic bio-marker. This study and the method proposed will be explored with more AML patients and will proceed to propose as a *non-invasive* diagnostic bio-marker.