

Diffusion weighted imaging (DWI) of Non-Hodgkin Lymphoma (NHL) patients refractory to previous treatment(s): preliminary results

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Introduction:

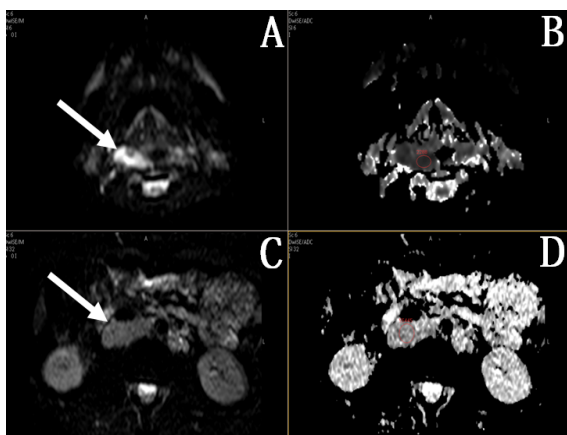
NHL is a diverse lymph proliferative malignancy which has an estimated mortality of over 20,000 patients only in the US for 2010 [1]. Most common imaging tools to assess the tumor burden for clinical NHL staging and treatment monitoring are FDG-PET, CT, and MRI with contrast injection. But in the last years it become clear that only measuring the morphologic tumor size changes under chemo and/or radiation therapy is insufficient for response evaluation in lymphoma [5]. Thus, new functional imaging methods are needed and recently FDG-PET-CT has been established for routine clinical determination of metabolic tumor viability [5]. NHL patients refractory to previous treatment(s) are more challenging because of residual fibrotic, inflammatory, or viable malignant tissue [2]. Recently, DWI has been used to study the diffusion characteristics of lymphoma and has shown the apparent diffusion coefficient (ADC) of newly diagnosed NHL patients to be significantly lower compared to normal lymph nodes [3]. In the present study DWI of the NHL patients refractory to previous treatment(s) are compared with those of the healthy volunteers and the literature.

Methods and Patients:

Thirteen studies in 10 NHL patients with retroperitoneal (n = 6), inguinal (n = 2), and others including paravascular lymphatic tissue, cervical, mediastinal, cutis, and bone lymphoma (n = 1 each) were conducted in a 1.5T MR scanner (Achieva, Philips Medical Systems, the Netherlands) with a multi element SENSE-body coil. For internal comparison inguinal lymph nodes of two healthy volunteers were evaluated and correlated with ADC data of the literature. The DWI was acquired using a single shot SE-EPI with Spectral Pre-saturation with Inversion recovery (SPIR) fat suppression with the following parameters: FOV = 230 mm, thickness/gap = 5.0/1.0 mm, voxel size = 1.8 x 2.99 mm, EPI factor = 77, and b-values of 0 and 1000 s/mm². The b₀ and b₁₀₀₀ images were registered and ADC maps were computed. Elliptical ROIs were carefully placed in the center of the tumors guided by an experienced Radiologist (TP). Furthermore, the corresponding T₂W and BFFE images were examined for accuracy and to avoid the necrotic areas. The mean ROI area was 175.2 ± 97.4 mm². For statistical analysis a Student t-test was performed (mean ± std for all values).

Results:

In our study ADC values (in 10⁻⁶ mm²/s) of tumor masses in NHL patients refractory to previous treatments (Figure 1: C,D) were not significantly different than those of the lymph nodes in our healthy volunteers (887.49 ± 251.25 vs. 1053.1 ± 179.75). These results are in contrast to recently reported ADC values of lymphoma in newly diagnosed NHL patients (700 ± 220 vs. 1000 ± 150) [3]. However, our determined ADC values of the lymph nodes in healthy volunteers were similar to the current literature [3,4]. Moreover, in one examined patient (Figure 1: A,B) with a newly diagnosed NHL, we found that the mean ADC was similar to the one reported in the literature (717.83 ± 111.53 vs. 700 ± 220) [3].



Conclusions:

In our study DWI showed no significant differences for apparent diffusion coefficients in lymphoma of NHL patients refractory to previous treatments compared to normal lymph nodes. Thus, a non-invasive differentiation between malignant and normal lymph nodes was not possible by quantitative ADC evaluations for these patients. This is in contrast to significant ADC differences reported previously in newly diagnosed NHL patients. Further studies with larger number of patients are required to verify these preliminary results.

Figure 1: DWI (A,C) and ADC (B,D) images of a newly diagnosed NHL patient with cervical lymphoma (A,B) and a refractory to previous treatment NHL patient with a retroperitoneal lymphoma (C,D). Arrows indicate the tumor.

References

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