3D arterial spin label perfusion MR imaging of head and neck tumors: the initial results

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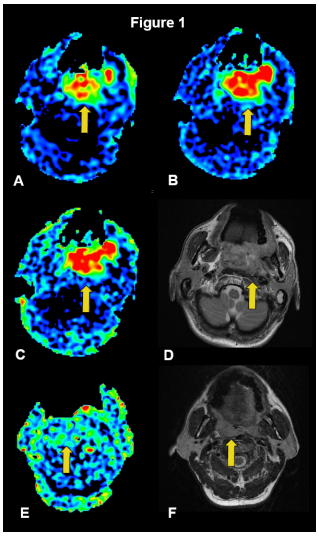
Introduction: Part of the challenge of head and neck tumors might be related to the heterogeneity of patients and tumor characteristics. Functional imaging such as perfusion-related imaging provide more additional important information about the biological behavior of the head and neck tumor. Arterial spin-labeling (ASL) techniques have been introduced for use in the quantitiative assessment of tissue perfusion without contrast media administration[1]. With the combination of, pseudo-continuous (PC) labeling approach, background suppression, and rapid 3D acquisition techniques using array receiver coils in high field, it is feasible to apply ASL in wider clinical areas[2]. the aim of our study was To evaluate the feasibility of 3D arterial spin label perfusion MRI technique applied to the head and neck tumors.**Methods**: This prospective study was proved by the local institutional review board. 23 patients with suspected head and neck tumors underwent head and neck 3D ASL MR examination. Patients were discarded because of serious metal artifact of treated teeth (n=1), or the tumor size less than 1.0 cm (n=5). Finally, 17 patients (age: 29-83 years, M/F:9/8) were enrolled in the study. 15 patients underwent surgery or biopsy after the MR examinations within two weeks. 3D ASL perfusion MRI data acquisition: All MR imaging studies were performed on a 3.0T MR imaging system by using an 8-channel head and neck joint coil. Three 3D ASL (ASL1, ASL2 and ASL3) examinations with different post label delays (PLD)［(PLD1=1025ms, PLD2=1525ms, PLD3=2525ms］were acquired during every scaning test. Before the ASL scan, conventional transverse T1-weighted and T2-weighted were performed. 3D ASL perfusion MRI data analysis: An experienced radiologist performed the MRI data analysis. 1) Patients' perfusion weighted images acquired from different 3D ASL sequences underwent the analysis of signal to noise ratio (SNR) for lesions (tumors and suspicious lymph nodes). $SNR=(SI_{lesion}-SI_{noise})/SD_{noise}$, SI is signal intensity, SD is standard deviation. 2) 3D ASL images of patients having histopathologic results were performed the analysis of blood flow (BF). ROIs of lesions were determined according to the axial T2 images which were fused with 3D ASL images. Statistical anaylysis: SNRs from three different 3D ASL images were analyzed by using paired t test. Analysis of variance (ANOVA) was used to compare BF values from different 3D ASL images. P value < 0.05 was considered significant. **Results**: 16 tumors and 4 lymph nodes underwent the SNR analysis. The mean SNRs of ASL1, ASL2 and ASL 3 were 8.16±5.30, 5.73±3.26 and 4.43±4.10, respectively. The mean SNR of ASL1 was significantly higher than those of ASL 2 (P=0.028) and ASL 3 (P=0.000). 14 tumors and 1 lymph nodes underwent the analysis of BF with the following eight histopathologic groups: GroupI: well and moderate-differentiated squamous cell carcinoma (SCC) (n=6);GroupII: poor-differentiated SCC (n=1); Group III: undifferentiated carcinoma of nasopharynx (n=1); GroupIV: lymphoma (n=2); GroupV: lymphoepitheloid carcinoma (n=1); Group VI: schwannoma (n=2); GroupVII: inflammation (n=1); GroupVIII: pleomorphic adenoma of parotid gland (n=1). There was no significant difference among the mean BF values of the three ASL (P=0.514). Figure1 shows examples the BF maps and axial T2 images of patients with different histopathologic types of SCC. The well and moderate-differentiated SCC shows significant higher BF values from all the three ASL maps［ASL1 (A), ASL2 (B),ASL3 (C) (arrows)］. The poor-differentiated SCC shows lower BF values (E). T2 images of the two patients (D and F) show the similar slightly high signal in the area of tumor (arrow). **Discussion and Conclusion**: First, 3D PCASL with the shorter PLD provided the better SNR. However, the BF values were not significant affected by the different PLD. Second, tumors with different histopathologic types had different BF values. Especially for SCC, the BF values were different with differentiated degree. However, we did not get statistical results because that the numbers of patients were so small and further researches with large sample sizes are needed. In summary, 3D ASL no-contrast perfusion MR imaging is feasibility to used in head and neck tumor, and shorter PLD is recommended. BF values show difference with different histopathologic types.



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