Diffusion-weighted SPLICE MR Imaging of the Salivary Gland in Patients with Sjogren Syndrome

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Abstract

A diffusion-weighted (DW) SPLICE MR imaging was performed on the salivary gland in 12 healthy subjects and 40 patients with Sjogren syndrome. The ADC values of salivary gland were calculated and correlated with the focus score. No significant difference of ADC values was observed between the healthy subjects and the patients with Sjogren syndrome. In patients at early stage of the disease (focus score < 2), however, ADC values were obviously higher than those of healthy subjects (p<.01). DW SPLICE MR imaging may be a promising technique in the early diagnosis of Sjogren syndrome.

Introduction

Sjogren syndrome is a chronic autoimmune disease characterized by lymphoid infiltration of exocrine glands, especially salivary and lacrimal glands resulting in dryness of the mouth and the eyes. Recent studies showed that MR sialography depicts the morphologic abnormalities of the salivary gland duct and its branches associated with Sjogren syndrome. However, the diagnostic accuracy of MR sialography in patients at earlier stages of the disease is not satisfactory (1). Diffusion-weighted (DW) MR imaging is sensitive to molecular diffusion, which is the random thermal motion of molecules. The most important clinical application of DW MR imaging is the detection and characterization of cerebral ischemia. However, clinical application of DW MR imaging in the head and neck has been limited because echo-planar DW MR imaging in this region has several inherent drawbacks, including susceptibility artifacts and chemical shift artifacts (2). Recently, DW MR imaging with split acquisition of fast spin-echo signals (SPLICE) has been proposed to overcome these drawbacks in echo-planar DW MR imaging (3). In contrast of echo-planar imaging, SPLICE sequence works well in the presence of inhomogeneities of the magnetic field. The purpose of this study is to apply the DW SPLICE MR imaging technique to the salivary gland imaging in the assessment of Sjogren syndrome.

Materials and Methods

DW SPLICE MR imaging has been performed on a 1.5 T whole-body imager (Magnetom Vision, Siemens, Germany) with a dedicated small-sized local coil. The diffusion gradients were applied in three orthogonal directions and the values for the gradient factor b were 205.38 and 1496.43 sec/mm^2 in this sequence. The other imaging parameters were: TR=5.9 msec, TE=65 msec, slice thickness=6 mm, FOV=225×225 mm, image matrix=128×256, in-plane resolution=1.76×0.88 mm, NEX=6, acquisition time=57 sec. The ADC values of the parotid gland were calculated according to the formula: ADC=-ln (Sh/Sl)/(bh–bl): Sh and Sl are the signal intensities in the regions of interest (ROI) on DW SPLICE MR images obtained with the two different gradient factors which are b values of 205.38 (bl) and 1496.43 (bh) sec/mm^2. The study population was composed of 12 healthy subjects and 40 patients with Sjogren syndrome (31 women, 9 men, 28-67 years old; mean age, 44 years). The diagnosis of Sjogren syndrome was determined by labial gland biopsy and the histopathologic grading was done by means of focus score. Focus score of 1 or more considered to be Sjogren syndrome. From the DW SPLICE MR images, ADC values of parotid gland were calculated bilaterally according to the above formula using signal intensities in the ROI of parotid gland. Statistical analysis was performed with the Student t test for comparison of ADC values between the healthy subjects and the patients with Sjogren syndrome. P values of less than .05 were considered to indicate significant differences.

Results

High quality DW SPLICE MR images were obtained in all healthy and diseased subjects. DW SPLICE MR images did not display any of the image distortions usually present on DW echo-planar MR images. There was no image distortion detected with diffusion weighting with larger b values. No technical failures were seen at DW SPLICE MR imaging. The average ADC values of the parotid gland in healthy subjects (n=12) was 0.61±0.09×10^{-3}mm^2/sec. On the other hand, the average ADC values of the parotid gland in patients with Sjogren syndrome (n=36) was 0.66±0.12×10^{-3}mm^2/sec. In the other 4 patients with Sjogren syndrome, the ADC values could not be calculated because of severe parotid gland atrophy. Statistically, no significant difference of ADC values was observed in the two groups. However, the ADC values in 15 patients at early stage of the disease (focus score < 2) (0.92±0.16×10^{-3}mm^2/sec) were obviously higher than those of healthy subjects (p< .01).

Conclusion

High quality DW MR images of the salivary gland can be obtained with SPLICE sequence. No significant difference of ADC values was observed between the healthy subjects and the patients with Sjogren syndrome. In patients at early stage of the disease, however, ADC values were obviously higher than those of healthy subjects. With regard to the patients at early stage of the disease, our preliminary results suggest a potential benefit of DW SPLICE MR imaging in the early diagnosis of Sjogren syndrome.

References

1) Tonami H, et al. J Comput Assist Tomogr 27: 517-524, 2003.
2) Yoshino N, et al. Radiology 221: 837-842, 2001.
3) Sumi M, et al. Am J Roentgenol 178: 959-965, 2002.