157. デュアルダイナミック造影 MRI

Dual Dynamic Contrast-enhanced MR Imaging

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Purpose: We developed a method for obtaining dynamic T1-contrast imaging and susceptibility (relaxation rate $[R2^*]$)-contrast imaging simultaneously to evaluate regional hemodynamics of the brain tumor.

Materials and Methods: On a 1.5T MR system (Philips Gyroscan ACS II), the dual dynamic contrast-enhanced MR (DUCE) imaging was obtained using a gradient echo (dual echo T1-FFE) pulse sequence with the keyhole technique to improve temporal and spatial resolution during a rapid bolus injection of Gd-DTPA. The dynamic T1-contrast images were obtained from the first echo; moreover, dynamic $R2^*$ images were calculated from the first and the second echo images to determine the contrast agent concentration curve ($\Delta R2^*$ - time) and to measure the regional cerebral blood volume (rCBV). This sequence was used with parameters of 60~120/ 5.8/ 21.7msec (TR/ first TE / second TE), acquisition matrix of 256×256 or 128×128 , flip angle of 40~70 degrees, slice thickness of 5~7mm, temporal resolution of 1.5~3.0 sec and FOV of 270×160 . In this report we establish the basic theory of this method and its clinical application.

Results: In DUCE imaging, the dynamic T1-contrast study provided us with information about characteristic enhancement patterns (vascularization $[Tm1]$ and permeability of blood-brain barrier $[Tm2]$) (Fig 1), and the dynamic susceptibility-contrast study provided a map of regional perfusion (cerebral microcirculation) in tumor site, peritumoral edemas and other surrounding regions of the brain (Fig 2). This method can be applied for the lesions of spine and musculoskeletal tissues. Appropriate setting of the parameters for the keyhole technique allowed us to improve the temporal and spatial resolution without losing image contrast (T1- and susceptibility- contrast).

Conclusion: The ability to obtain dynamic T1- and susceptibility- contrast imaging at a time allows us to optimize the advantages of each and thereby evaluate more about the microvascular circulation of the brain lesions.

Figure 1 Dynamic T1-contrast study of a olfactory groove meningioma with the DUCE imaging.

Figure 2 Same patient as in Figure 1. Dynamic susceptibility-contrast study with the DUCE imaging.