Assessment of Vascular Malformations in the Head and Neck with Two-Dimensional MR Digital Subtraction Angiography (2D MRDSA)

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Introduction
It is important to estimate the degree of vascularity and arteriovenous shunt in soft-tissue vascular malformations, because treatment method depends on hemodynamics of the lesions. The purpose of this study was to evaluate the usefulness of twodimensional thick-slice magnetic resonance digital subtraction angiography (2D MRDSA) technique in the assessment of vascular malformations in the head and neck.

Methods
Twenty-four clinically diagnosed vascular malformations underwent contrast-enhanced 2D MRDSA. 2D MRDSA was performed by fast spoiled gradient echo sequence (TR=5.8ms, TE=1.3ms, flip angle=20-40, FOV=24-38cm, matrix=512x192, slice thickness=50-100mm). Each image was taken within one second, and a set of 60-120 images was obtained during intravenous bolus administration of gadolinium chelates. The typical injection rate was 10ml/s with total amount of 15ml. The pre-contrast image was used as a mask to produce subtraction angiograms.

Ten lesions were subsequently examined by intraarterial digital subtraction angiography (IADSA), and were treated with percutaneous sclerotherapy with or without arterial embolization.

Results
The twenty-four lesions were subdivided into two groups by 2D MRDSA findings; high-flow group (including arteriovenous malformation) which showed arterial dilatation, early venous filling, or prominent abnormal blood pooling, and low-flow group (including venous and lymphatic malformation, embolized arteriovenous malformation) which only showed faint abnormal blood pooling.

In conclusion, 2D MRDSA has enough temporal resolution and is a useful non-invasive method to estimate hemodynamics of vascular malformations in the head and neck, because circulation time within high-flow vascular malformation is very short. Furthermore, 3D technique requires a high performance imager and additional software which are not widely available. When trading off 3D information, 2D acquisition must be superior to 3D acquisition in temporal resolution. 2D MRDSA has a simple sequence design without a high gradient performance. Therefore, we believe that 2D MRDSA is more widely prevailed.

Discussion
Our 2D MRDSA with high temporal resolution uniquely demonstrated head and neck hemodynamics like X-ray angiography. Administration of Gadolinium-chelates is essential in order to evaluate vascular malformations in the head and neck MR examinations. Obtaining MRDSA images costs only a short amount of time with minor post-processing when a contrast media is given anyway. Thus MRDSA offers additional information about hemodynamics with little cost and risk. To the contrary, although IADSA provides more precise hemodynamic information, it is rather invasive and needs more expense, time and labor. Therefore MRDSA has an important advantage and a potential to obviate some IADSA examinations.

References