

MR Matas Test: Comparison with Conventional Intraarterial Balloon Occlusion Matas Test

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Introduction

Matas test with intracranial temporal balloon occlusion is widely performed study for patients with head and neck tumors for assessing cerebral cross flow via Willis' ring before tumor resection. However, this study has its own risk because the test is intraarterial procedure (1). We developed MR Matas test, which is contrast enhanced 2DMR angiography (we called it MR digital subtraction angiography, MRDSA (2-4)) with temporary occluded unilateral internal carotid artery by hand. The goal of this study is evaluating applicability of the MR Matas test.

Methods

The MR Matas test was performed on an open type MR imager (Signa Profile 0.2 tesla ver. 7.5, GE-YMS, Tokyo, Japan) equipped with gradients that had a maximum slew rate of 17T/m/sec and a gradient strength of 10mT/m after conventional MR images (precontrast T1 weighted images and T2 weighted images) were obtained.

Five patients (three males, two females, mean age 65.8 y.o.) with head and neck tumors were prospectively studied on MR Matas test. Within two weeks before or after the MR Matas test, conventional balloon occluded Matas test was performed in all cases.

a. MR imaging and analysis

MRDSA is essentially fast spoiled gradient echo sequence. Imaging parameters were as follows: TR/TE: 12.6/3.8 ms, field of view: 26x19.5 cm, matrix: 256x160, flip angle: 80 degree, bandwidth: 20 kHz, slice thickness: 80mm, using a software option, "Rapid frame" a kind of shared k-space segmentation. "Rapid frame" enabled to reduce scan time, minimum .5 sec/1image. This time resolved MRA was performed just after bolus injection of Gadolinium cheletes (5ml/sec, total 0.2mmol/kg) intravenously, followed by 20ml of saline flush with a power injector. During scanning, unilateral internal carotid artery was compressed by hand and temporally occluded (Fig.1). After the scanning, images were generated on commercial available workstation (Advantage Windows ver.3.0, GE, WI). The last image before the contrast arrival in FOV was selected and subtracted from later images. We made comparison between these subtracted images of MRDSA and these of IADSA at the point of demonstration of cerebral blood flow and image quality. Moreover, positive enhancement integral (PEI) based on MRDSA was calculated on the same workstation and displayed in rainbow color. We also made comparison between images of PEI and brain single photon emission computed tomography (SPECT).

b. Balloon occluded Matas test with brain SPECT

Selective intraarterial digital subtraction angiography (IADSA) was performed in major cerebral arteries and branches, followed by balloon occlusion Matas test in all cases. During balloon occlusion, 99m Tc-ECD was injected intravenously and brain SPECT was performed.



Fig.1. Fig.1 shows how to compress the unilateral internal carotid artery beside open type MR imager.

Results

It was possible to confirm the occlusion of the carotid artery, which is compressed by hand on MR Matas test (5/5). Moreover, MR Matas test demonstrated cross flow from patent site to occluded site via Willis' ring in all cases (5/5) (Fig.2, 3).

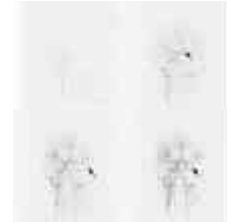


Fig.2. A case with hypopharyngeal cancer. Left ICA was compressed and temporary occluded by hand. MRDSA demonstrated cross flow probably via Willis' ring from patent site to occluded site (arrows).



Fig.3. IADSA demonstrated cross flow from patent site to occluded site via anterior communicating artery (arrows).

However, imaging quality of MR Matas test were insufficient compared with IADSA to observe stenosis of vessels and vascular wall irregularity. PEI based on MR Matas test demonstrated symmetrical perfusion, as brain SPECT images (Fig 4, 5).

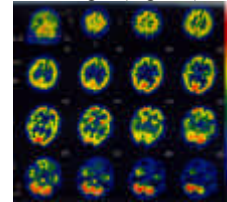


Fig.4. Brain SPECT showed symmetrical perfusion in both sides.

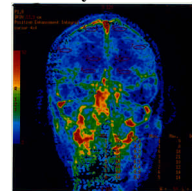


Fig.5. Positive enhancement integral based on MR Matas test show no differences in both sides as brain SPECT.

Discussion

MR Matas test needs only intravenous injection and no X-ray exposure. That means MR Matas test may possess clinical applicability as a safer screening test for the candidates for balloon occlusion Matas test with head and neck tumors.

References

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