Arterial Spin Labeling (*syngo* ASL) Case Reports from Nagoya University

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Case 1
Patient history

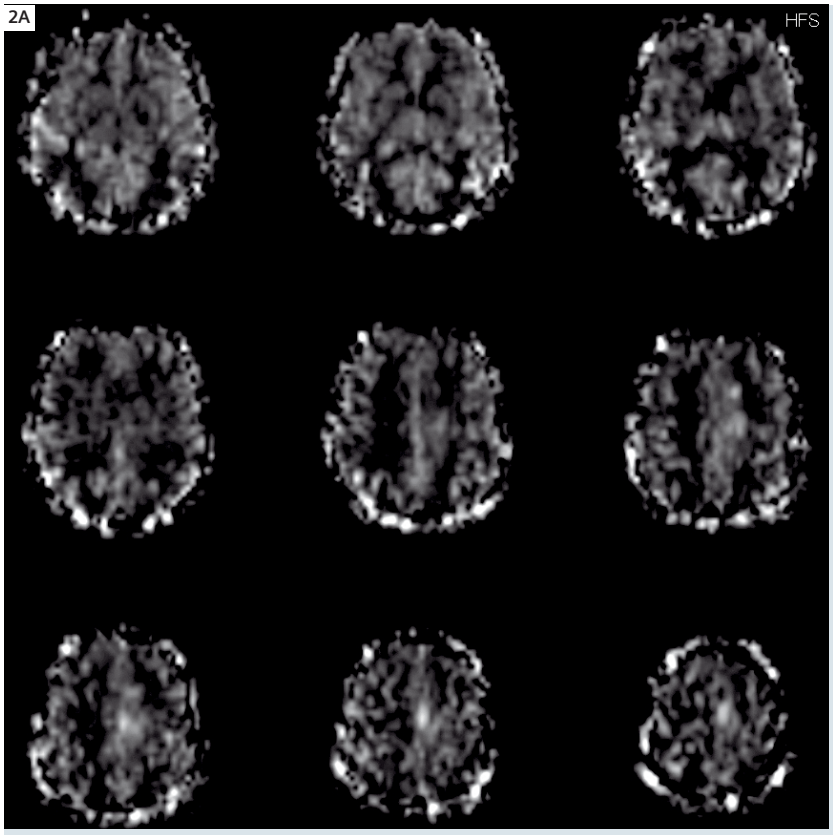
40-year-old man had been operated because of a brain tumor in the left frontal lobe. After the operation, chemotherapy was applied. Recently, the patient showed focal seizure at his right upper limb.
Based on the MRI images we suspected the recurrence of brain tumor.
A second operation was performed to remove the brain tumor at left frontal lobe.The pathological diagnosis was a glioma grade 3.

Image findings / Results

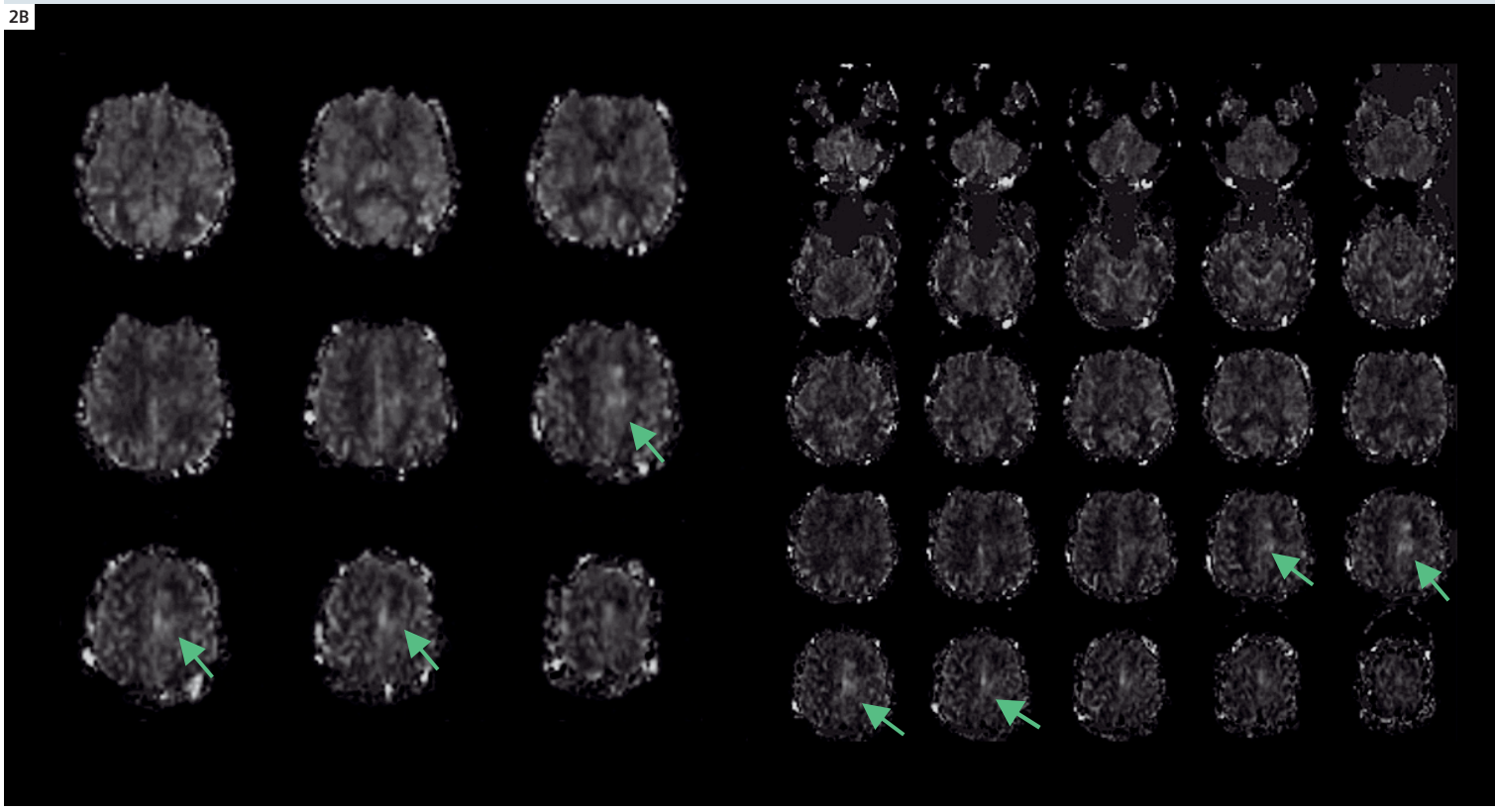
The T2-weighted axial image shows that the abnormal signal intensity of the medial part of the left frontal lobe near the first operative surgical defect is enlarged compared with the MRI image of two months ago, and corresponding contrast-enhancement is not observed inside this tumor. Relative cerebral blood flow (rCBF) was increased in this tumor.
By these findings, we could not diagnose that this tumor was only grade 2, and suspected this tumor contained grade 3.

With ASL there was no significant difference between 3T and 1.5T. It takes 4:40 min and 1:02 min* to obtain 25 slices and 9 slices of ASL with 3T MAGNETOM Trio. And it takes 4:22 min* to obtain 9 slices of ASL with 1.5T MAGNETOM Avanto.
The Siemens unique multi-slice ASL sequence has Inline perfusion-weighted imaging (PWI) and regional cerebral blood flow (rCBF) processing.

1A T2-weighted ASL PICORE Q2TIPS. TR 2500, TE 13, TI 2 = 1800, TI 1 = 700, TI 1s = 1600, TA 1:02 min., matrix 64 x 64, FoV 240, Bandwidth 2230, Flip angle 90°. **1B** T1-weighted ASL PICORE Q2TIPS. TR 2500, TE 13, TI 2 = 1800, TI 1 = 700, TI 1s = 1600, TA 1:02 min., matrix 64 x 64, FoV 240, Bandwidth 2230, Flip angle 90°.



2A rCBF with 1.5T MAGNETOM Avanto.
2B rCBF with 3T MAGNETOM Trio.
For ASL there was no significant difference between 3T and 1.5T.



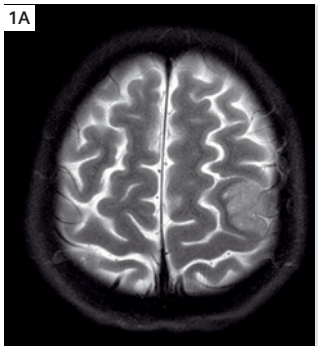
Case 2
Patient history

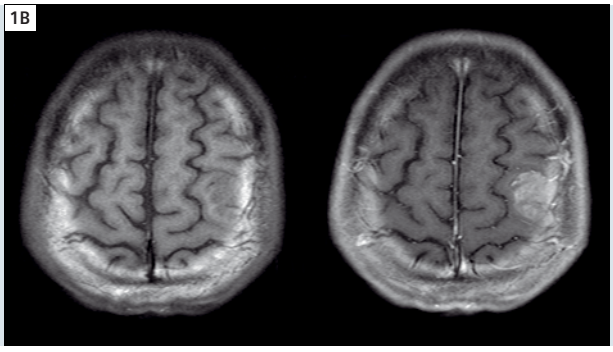
59-year-old man recently noticed dysarthria and motor weakness of right mouth angle. MRI revealed that a brain tumor was located in the fold just before the central sulcus in the left hemisphere, that is, the face area of the primary motor cortex. The patient's condition gradually deteriorated; therefore, the removal of this tumor was planned. Glioma G3 is predicted by preoperative findings by MRS, FDG and methionine PET.

Image findings / Results

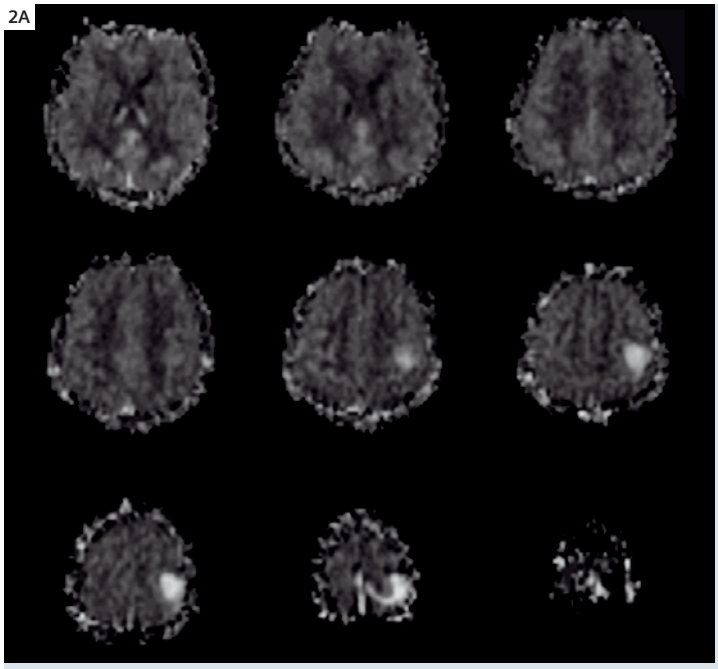
The T2-weighted axial image shows the abnormal signal intensity of the dorsal part of left frontal lobe.
Corresponding contrast-enhancement is partly observed inside this tumor. rCBF is increased in this tumor. MR Spectroscopy (MRS) showed the pattern of malignant glioma.
By these findings, we suspected that this tumor was a grade 3 glioma.
The lesion could be clearly recognized at 3T. Not so clearly at 1.5T.

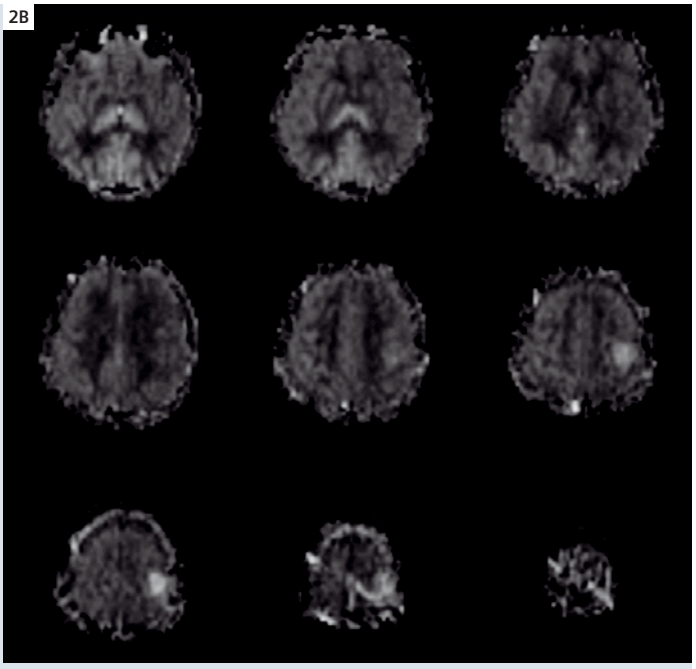
It takes 4:40 min and 1:02 min* to obtain 25 slices and 9 slices of ASL with 3T MAGNETOM Trio. And it takes 4:22 min* to obtain 9 slices of ASL with 1.5T MAGNETOM Avanto.





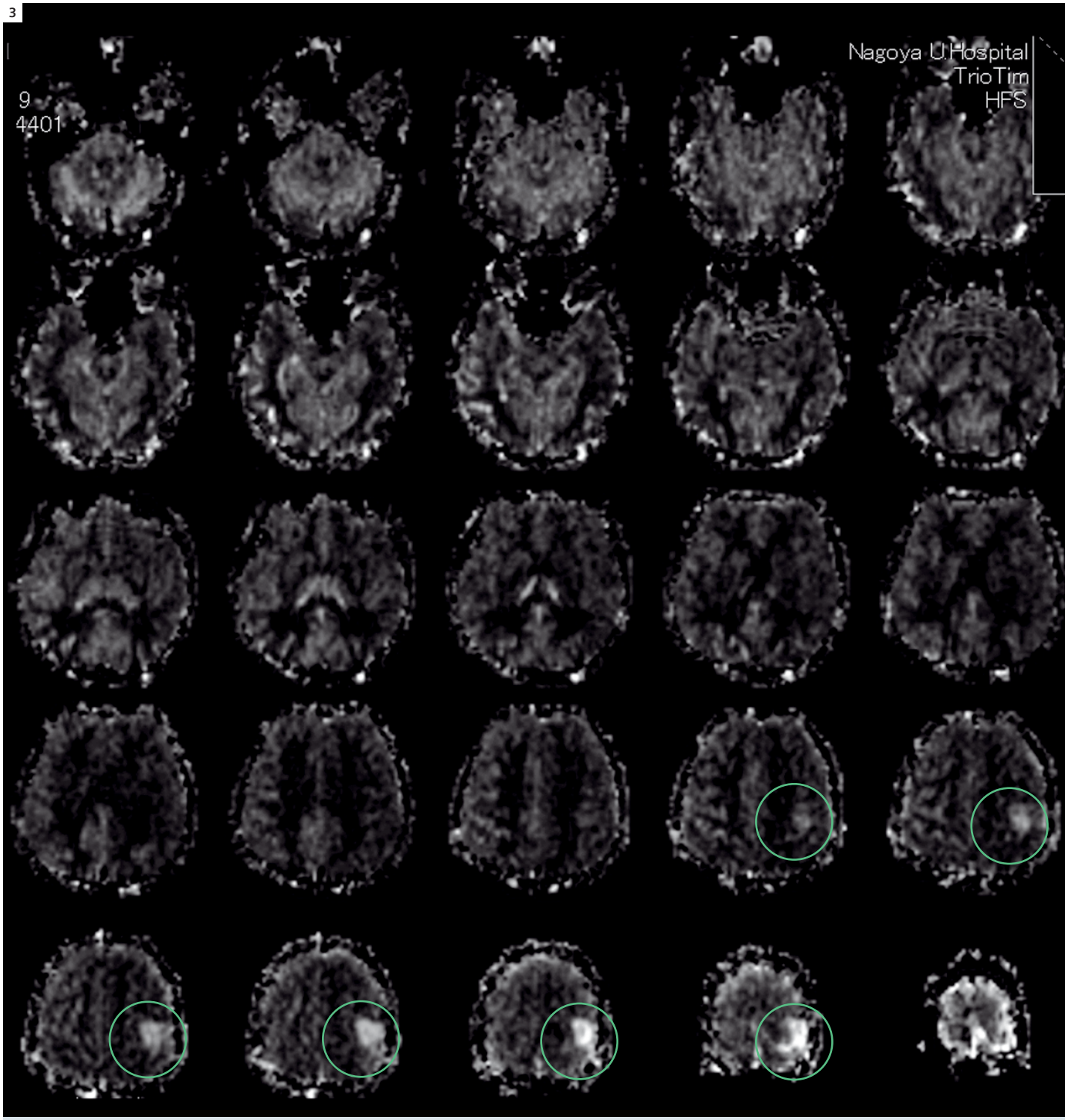
1A T2-weighted image. Brain tumor located in pre central gyrus, that is primary motor cortex (from the lateral part of hand area to the face area). ASL PICORE Q2TIPS. TR 2500, TE 13, TI 2 = 1800, TI 1 = 700, TI 1s = 1600, TA 1:02 min., matrix 64 x 64, FoV 240, Bandwidth 2230, Flip angle 90°.
1B T1-weighted images.





2A ASL with 3T MAGNETOM Trio rCBF was increased in the brain tumor.

2B ASL with 1.5T MAGNETOM Avanto The lesion could be more clearly recognized at 3T than at 1.5T.



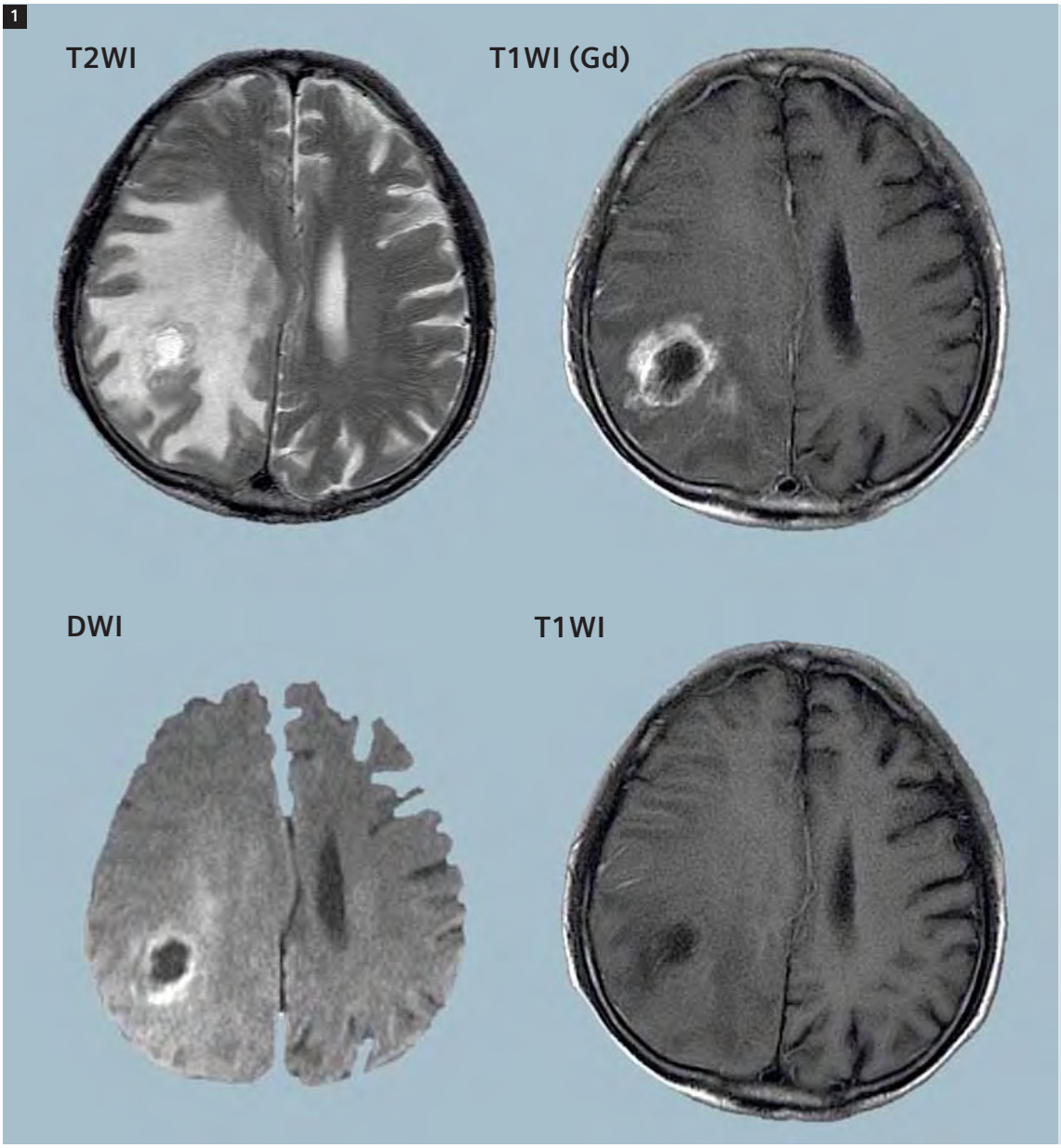
3 ASL with 3T MAGNETOM Trio, whole brain scan.

Case 3
Patient history

66-year-old male recently noticed motor weakness of left hand, and this symptom gradually deteriorated. An MRI showed mass lesion located in the right parietal lobe with ring enhancement and brain edema was widely observed.
Malignant tumor, that is, Glioblastoma or metastasis was suspected by MRI findings. The pathological diagnosis was glioblastoma at WHO grade 4.

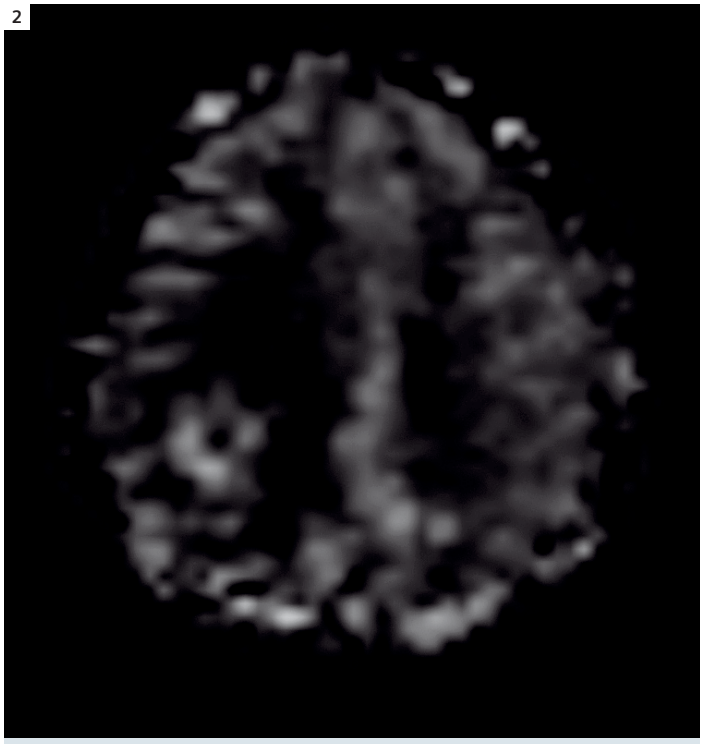
Image findings / Results

Ring enhanced mass was found in the right parietal lobe with apparent brain edema. Spotty enhanced areas were also found. rCBF is considered to be partly increased in this tumor.
By these findings, we suspected that this lesion was a glioblastoma, metastasis and brain abscess.
Diffusion-weighted imaging did not show very high signal, therefore, brain abscess was unlikely. Open biopsy was performed and revealed glioblastoma at WHO grade 4. It takes 4:40 min and 1:02 min* to obtain 25slices and 9 slices of ASL with MAGNETOM Trio. And it takes 4:22 min* to obtain 9 slices of ASL with MAGNETOM Avanto.
The reslults of ASL do not differ between 3T and 1.5T. There is, however, a great difference in acquisition times.



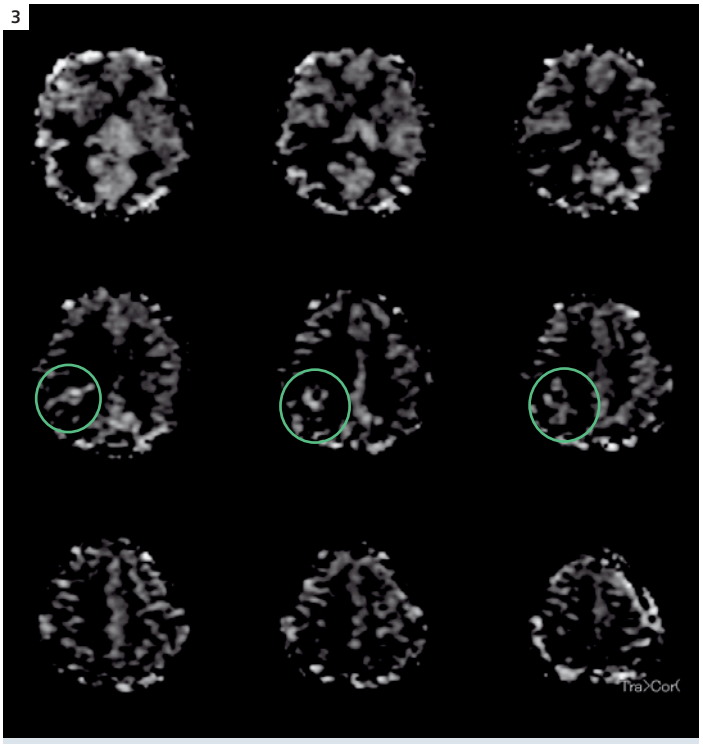
1 Ring enhanced mass was found in the right parietal lobe with apparent brain edema. Spotty enhanced areas were also found. By these findings, we suspected that this lesion was glioblastoma, metastasis and brain abscess.

2



2 Diffusion weighted imaging did not show very high signal, therefore, brain abscess was unlikely. rCBF is partly increased in this tumor.

3



3 ASL with 1.5T MAGNETOM Avanto.

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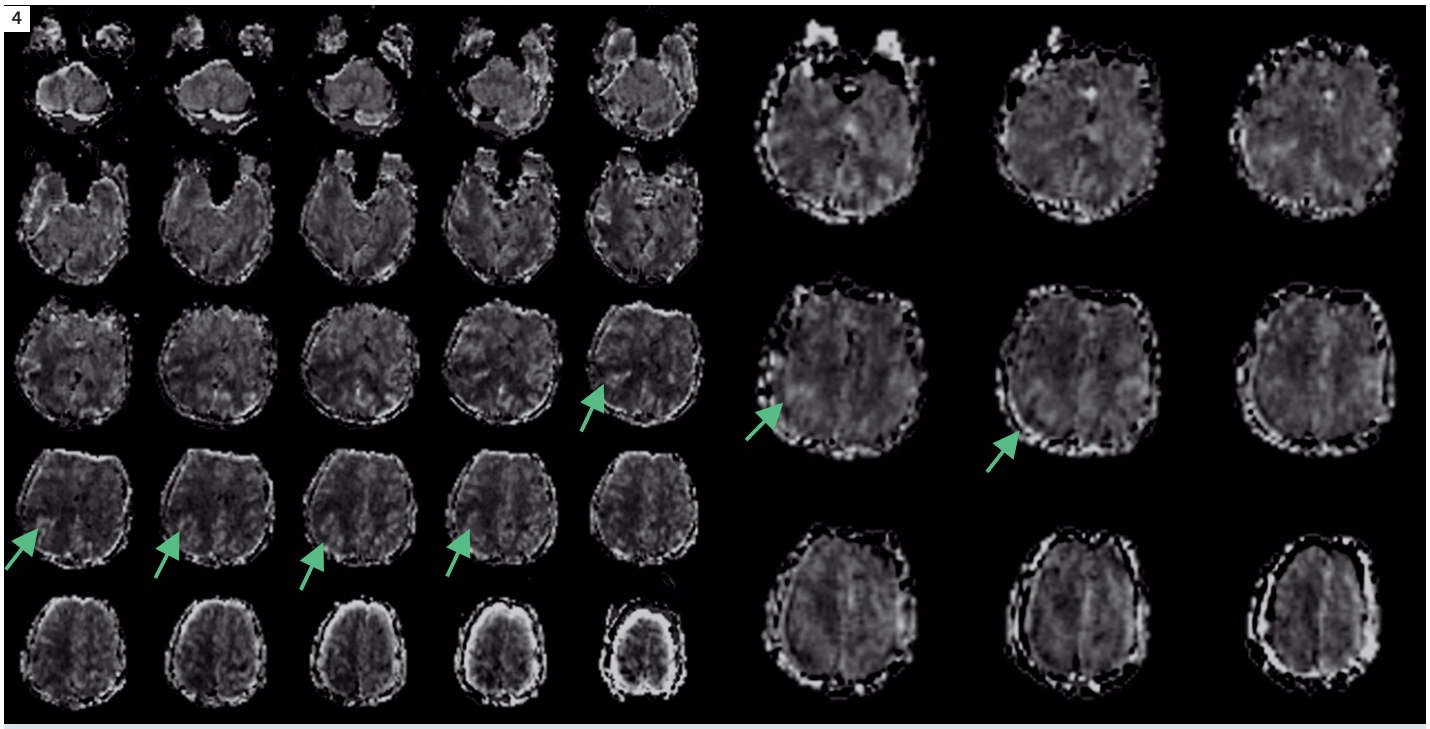

4 ASL with 3T MAGNETOM Trio. The image on the right is blurred because of motion artifacts. We found significant difference between 3T and 1.5T.

1A T2-weighted image.
1B Susceptibility-weighted image (*syngo* SWI). Subcortical hemorrhage was observed in the right parieto-occipital lobe. Brain edema was confirmed near hemorrhage, but mass sign was not so severe. We could not find apparent ischemic lesion in the left hemisphere.

Case 4
Patient history

65-year-old female presented in the emergency room with disturbance of consciousness and suddenly occurring left hemiparesis. Head CT showed subcortical hemorrhage in the right parieto-occipital lobe. She was admitted to the intensive care unit (ICU). The patient was managed conservatively and follow up MRI was performed.

Image findings / Results

MR imaging showed the subcortical hemorrhage in right parietal lobe. MR angiography (MRA) showed no vascular abnormality in the right hemisphere and accidentally disclosed left M1 occlusion. rCBF is decreased in the area of left main coronary artery (MCA).

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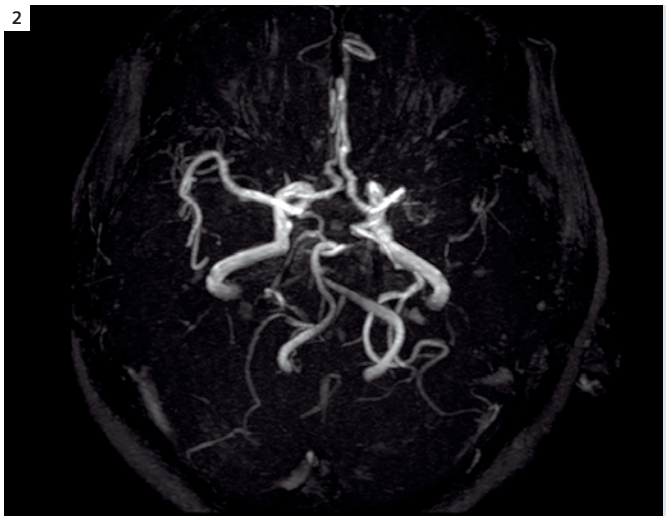
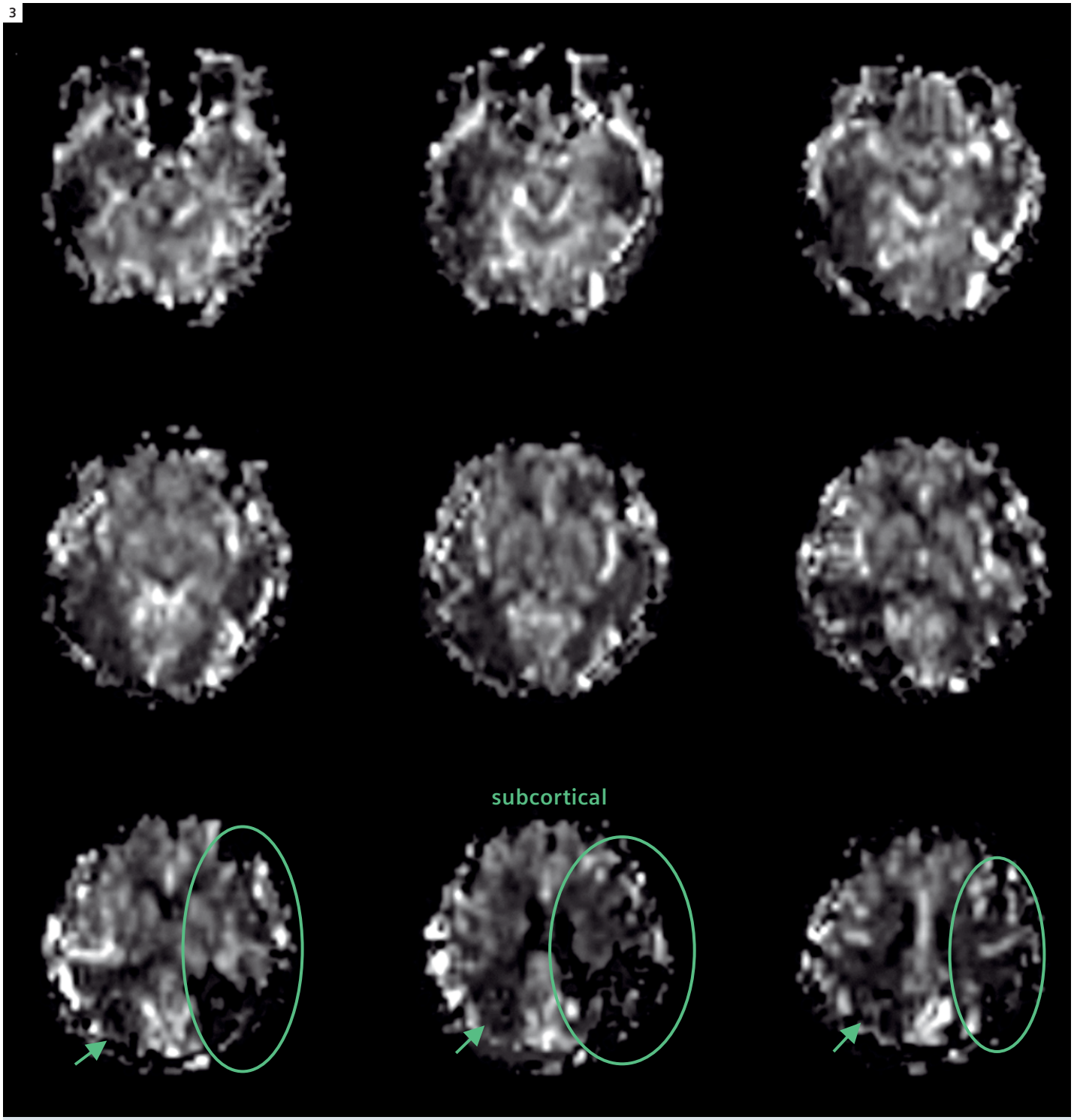


2 MR Angiography: left M1 occlusion was suspected. This patient did not complain of motor weakness of the right hand.

*Results may vary. Data on file.



3 Arterial Spin Labeling (ASL): rCBF is decreased in the area of the left middle cerebral artery (MCA).