

Brain Metastasis of Breast Cancer

Fluid-suppressed APT weighted imaging predicts tumor progression one year before DSC perfusion



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Key message

This case report shows the possibility to provide earlier accurate diagnosis through Amide Proton Transfer weighted after fluid suppression (F.S. APTw).

Introduction

A 56-year-old woman with a single brain metastasis of a HER2-positive breast cancer was treated with complete resection and Gamma Knife (GK) stereotactic radiotherapy of the surgical cavity. Three months after the GK procedure the patient was admitted to the hospital for seizures.

A computed tomography (CT) examination revealed no hematoma and the presence of a lesion near the surgical alterations was suspected (images not shown).

A Magnetic Resonance Imaging (MRI) protocol confirmed the presence of a contrast enhancing lesion neighboring the radiotherapy field (see arrow in Figure A). One-month multimodal MRI follow-up showed an increase in the contrast-enhancing lesion and in the perilesional edema. No neo-angiogenesis was seen on Dynamic Susceptibility Contrast (DSC) perfusion relative Cerebral Blood Volume after leakage correction (L.C. rCBV) map (Figure B), therefore suggesting a radionecrotic phenomenon. Some small areas of diffusion restriction were detected, even though near hemosiderin alterations impaired the interpretation of Apparent Diffusion Coefficient (ADC).

F.S. APTw map revealed a large increase in amide signal intensity inside and beyond hemosiderin remnants (see arrow in Figure B). Mobile proteins and peptides are the main contributors of amide signal in APTw contrast, and they are known to increase in neoplastic tissue. Therefore, F.S. APTw suspected tumor progression in contrast to DSC perfusion L.C. rCBV map.

Nine-month follow-up

The patient underwent regular three-month follow-up. She was clinically stable under low dose of corticosteroids. Extracranial disease was also stable. Multimodal MRI repeatedly showed no hyperperfusion on L.C. rCBV map (Figure C). Conversely, F.S. APTw constantly showed an increase in amide signal intensity in the evolving lesion. In addition, the area of amide signal hyperintensity continued to expand (see white arrow in Figure C).

One-year follow-up

One year after the first multimodal MRI follow-up the patient's condition worsened. This time the contrast enhancing lesion displayed areas of neo-angiogenesis both on DSC and ASL perfusion (see respectively L.C. rCBV and CBF maps in Figure D), in favor of tumor progression. These hyperperfused areas overlapped to the areas of increased amide signal intensity (see F.S. APTw in Figure B and C).

The lesion was surgically removed, and histological examination confirmed its neoplastic nature.

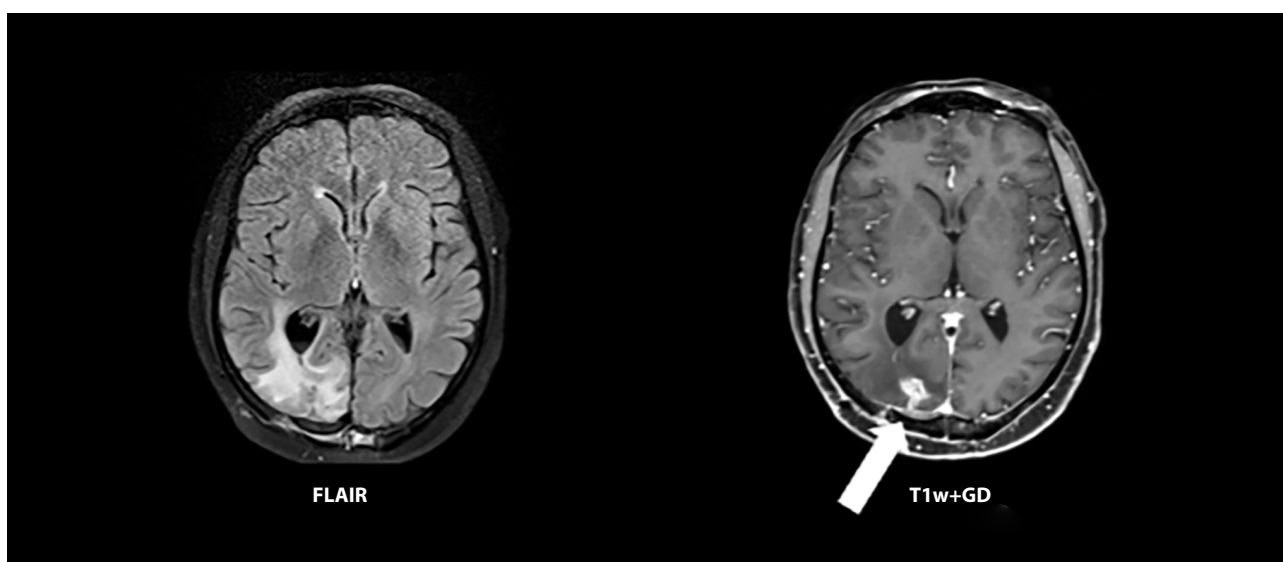


Figure A A contrast enhancing lesion

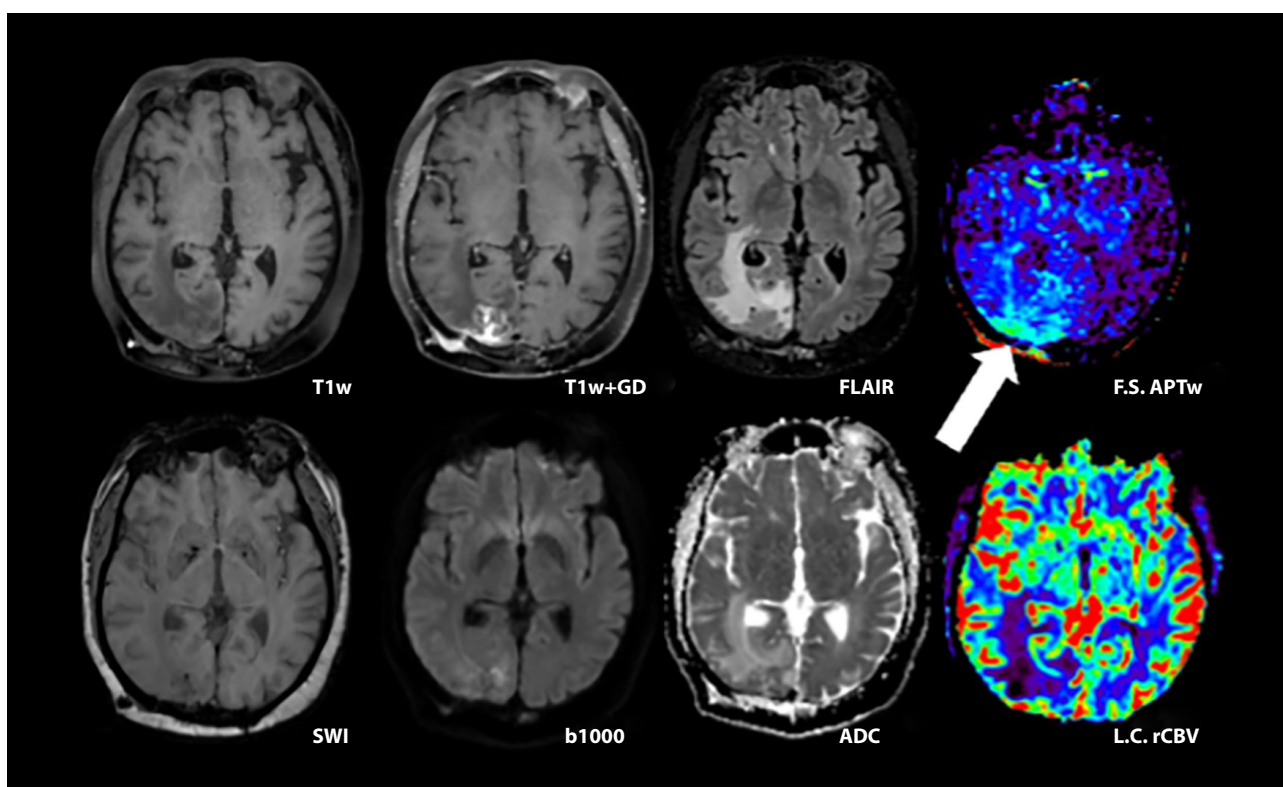


Figure B Comparison between DSC perfusion L.C. rCBV and F.S. APTw maps on 1-month MRI follow-up

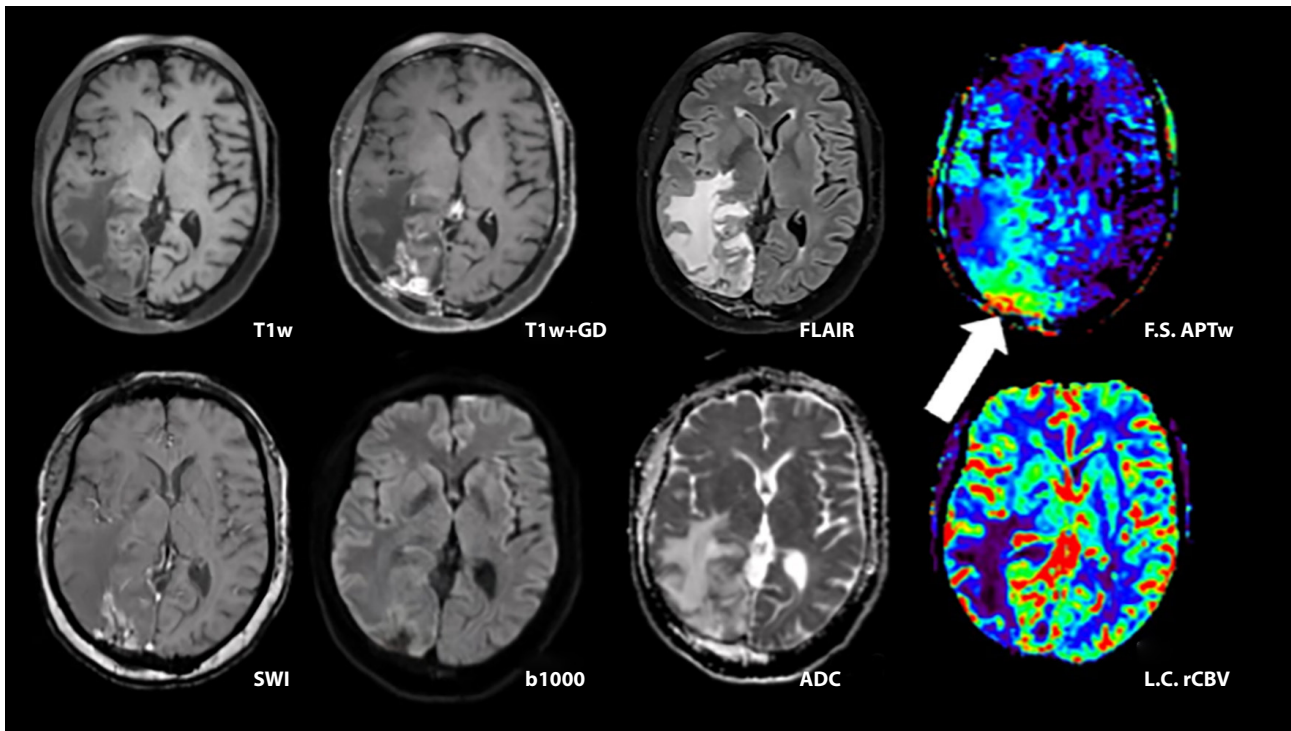


Figure C Comparison between DSC perfusion L.C. rCBV and F.S. APTw maps on 9-month MRI follow-up

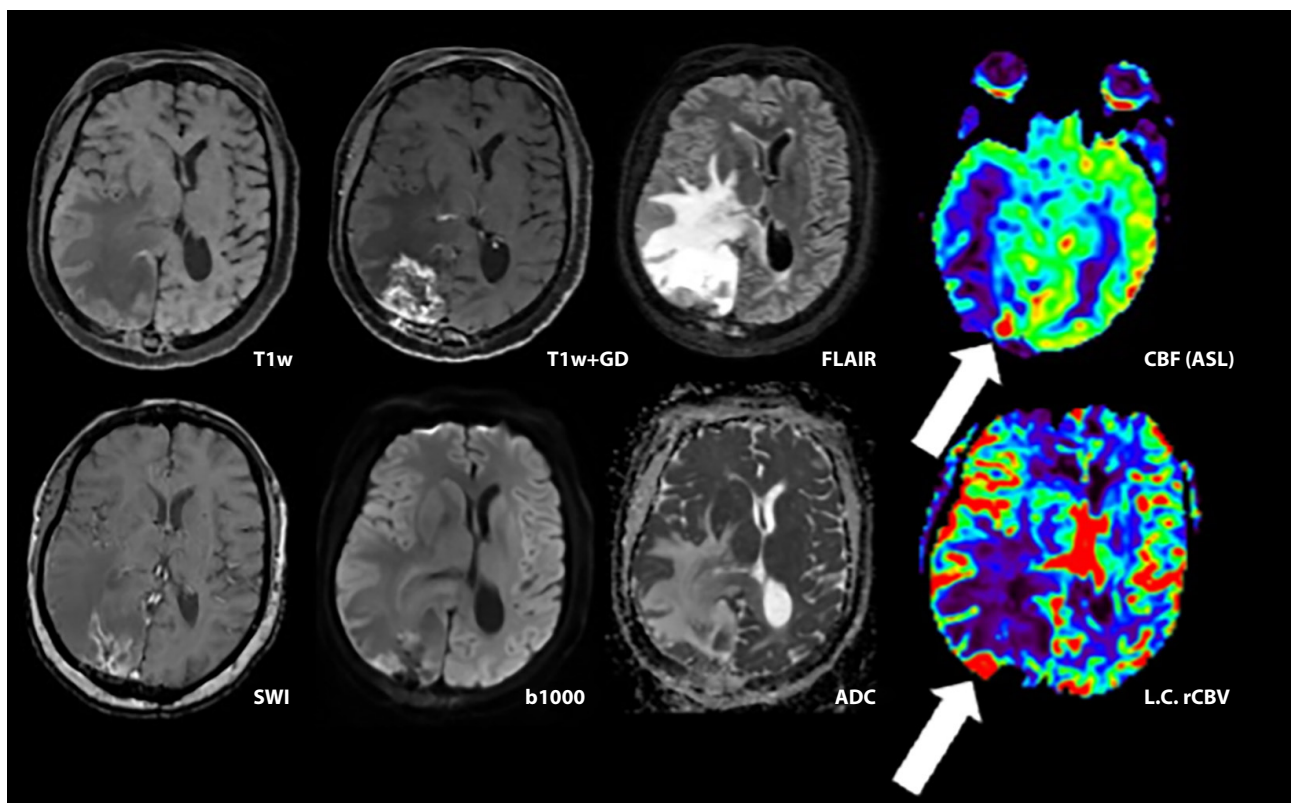


Figure D DSC perfusion L.C. rCBV and ASL CBF maps on 1-year MRI follow-up

Conclusion

F.S. APTw endogenous contrast is a useful complement to current multi-modal protocols as it non-invasively provides earlier diagnostic biomarkers of tumor progression.

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