

“Pool sign” in Cerebral Metastatic Adenocarcinoma

Ajith Cherian, Divya KP, Pranab K. Prabhakaran¹, Jithu Jose, Poornima Narayanan, Bejoy Thomas²

Department of Neurology, Sree Chitra Tirunal Institute for Medical Sciences and Technology, ¹Department of Medical Oncology, Regional Cancer Centre, ²Department of Imaging Sciences and Interventional Radiology, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, Kerala, India

A 48-year-old male, with no comorbidities, presented with shock like pain over left neck and shoulder, aggravated with neck movements. A month later, he had left hemiclonic seizures, preceded by a sensory aura. He had significant weight loss of 5 kg over 2 months. His initial magnetic resonance imaging (MRI) brain showed a ring enhancing lesion in the right parietal region with perilesional edema. His cerebrospinal fluid study was normal, mantoux, TB PCR and tumor markers were negative. Since he worsened and developed progressive paresis of his left upper limb, he was reimaged (6 weeks after the initial imaging), which showed significant increase in perilesional edema with peripheral enhancing lesion in right parietal subcortical white matter. In addition to that, there was a perilesional T2 hyperintense rim “the pool sign” immediately adjacent to the solid mass, deep to the peritumoral vasogenic edema [Figure 1a-e] which was not seen in the initial MRI. He underwent a computed tomography (CT) of the chest, which showed a mass lesion in the left upper lobe of the lung [Figure 1f], biopsy of which confirmed an adenocarcinoma.

An intracranial mass has two differentials – a primary neoplasm and metastasis. In the setting of a solitary intracranial metastatic lesion, further work-up is warranted to find the primary. Most intracranial lesions are biopsied for diagnosis, with its inherent risks. Metastatic adenocarcinomas reveal themselves by exhibiting a perilesional T2 hyperintense rim immediately adjacent to the solid mass, deep to the peritumoral vasogenic edema. This T2 hyperintense rim appears to be pooling along the solid portion of the lesion, and is therefore referred to as the “pool sign”. It is higher in signal intensity relative to the vasogenic edema and is presumed to be secondary to secretions. A case series of this specific imaging finding in the setting of metastatic adenocarcinomas has been previously described.^[1] “Pool sign” is perhaps a time dependent one as it was not evident in the first image but emerged later.

Techniques used to differentiate metastasis from a brain primary include dynamic contrast-enhanced perfusion MRI, spectroscopy and molecular imaging^[2,3] which require time consuming post-processing of images. Here, conventional T2-weighted images made the “pool sign” more conspicuous, and therefore extremely practical and useful. Signal characteristics of the rim of high T2 signal were variable on T1-weighted imaging, but typically are isointense to hypointense relative to the gray matter. The T2 fluid attenuated inversion recovery (FLAIR) sequence tended to blend the rim with the surrounding vasogenic edema, especially if there was a thin pool. The “pool sign” is due to leakage of

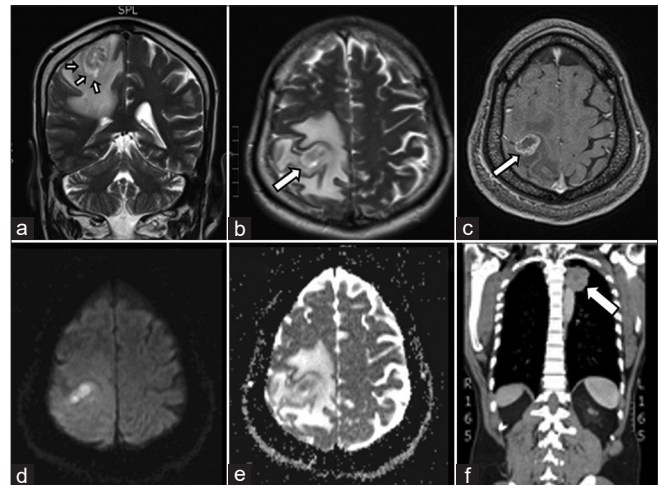


Figure 1: The pool sign-T2 coronal (a) and axial (b) MR images showing hyperintensities encircling the lesion (arrows) brighter than the surrounding edema, T1 post contrast image (c) showing peripheral enhancement. The lesion shows restricted diffusion in DWI (d) and ADC (e) images. CT chest (f) with the left solitary lung lesion (arrow) histopathologically proven as adenocarcinoma

secretions from the metastatic adenocarcinoma, which when copious, can surround it entirely, and if scanty can show partial pooling on one side. “Pool sign” helps to focus the metastatic work-up on locations where adenocarcinomas are most common like lung and gastrointestinal tract. Any tumor that has secretory features, such as neuroendocrine tumor, could probably produce the “pool sign”. The presence of the “pool sign” in a solitary intracranial lesion is favoring a metastatic adenocarcinoma over a primary brain neoplasm.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other

Address for correspondence: Dr. Divya KP,
Department of Neurology, Sree Chitra Tirunal Institute for Medical Sciences
and Technology, Trivandrum - 695 011, Kerala, India.
E-mail: drdivyakp01@gmail.com

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clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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